

**4<sup>th</sup>** Report on  
**The World Nutrition Situation**  
J a n u a r y 2 0 0 0

Nutrition  
Throughout  
the Life Cycle

U n i t e d N a t i o n s  
A d m i n i s t r a t i v e C o m m i t t e e o n C o o r d i n a t i o n  
**Sub-Committee on Nutrition (ACC/SCN)**

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in collaboration with  
**International Food Policy Research Institute (IFPRI)**

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# FOREWORD

**T**he *Fourth Report on the World Nutrition Situation* is part of a series of ACC/SCN reports initiated in the mid-1980s on the nutritional status of populations in developing countries. These reports provide important information for the many individuals, institutions, governments, and nongovernmental organizations working to accelerate nutrition action. While earlier reports have focused on regional trends in preschool undernutrition, this report is built around the theme *nutrition throughout the life cycle*. This change was signalled, in part, by growing evidence of the linkage between foetal undernutrition and chronic disease later in life, as well as new estimates of the global magnitude of growth retardation during foetal life.

This report highlights the size of the malnutrition problem and its consequences for human and economic development. It stresses the need to move ahead in creative partnerships.

The *Fourth Report* provides evidence of contrasts—contrasts in the prevalence and trends of malnutrition, contrasts in actions taken, contrasts in progress made, and contrasts in the availability of data on the extent and causes of malnutrition. As Chapter 1 shows, stunting in preschool children is falling globally and is expected to continue to fall over the next five years, reaching 29% in 2005 compared with 47% in 1980. Underweight affects 149.6 million children, or 27% of children in the developing world, down from 37% in 1980. The size of the

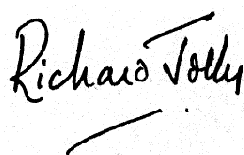
malnutrition problem is still vast, however, and progress in most regions is all too slow.

National iodization programmes are effective in delivering iodine to whole populations in many countries, offering protection against the devastating consequences of iodine deficiency disorders (IDD). Achievements in Africa are especially encouraging, where on average 63% of people living in countries with IDD now have access to iodized salt. Monitoring and sustainability are now key to long-term success. However, many affected countries still have not launched iodization programmes, and IDD is still a reality for their populations.

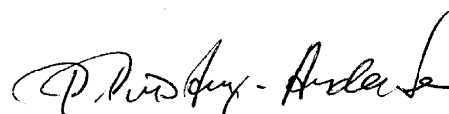
While there are many cost-effective approaches to reducing vitamin A deficiency, subclinical deficiency still affects probably up to 250 million preschool children and unknown numbers of school-age children, adolescents, and pregnant women. Subclinical vitamin A deficiency contributes enormously to elevated morbidity and mortality in many age groups.

Iron deficiency remains a huge problem, affecting preschool children and pregnant women in particular. Though it is thought to affect over two-thirds of the developing world, trends are unknown.

The *Fourth Report* is the result of a successful partnership between the ACC/SCN, the Food Consumption and Nutrition Division of the International Food Policy Research Institute, and the many UN and other agencies that provided access to their data and expertise. Editorial control rests with the ACC/SCN Secretariat.



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# HIGHLIGHTS

## Foetal Undernutrition

1. Some 30 million infants are born each year in developing countries with impaired growth due to poor nutrition during foetal life. Population-wide interventions aimed at preventing foetal growth retardation are urgently needed in many countries.
2. Low birthweight at term, often used as a proxy indicator for intrauterine growth retardation, is especially common and serious in South Central Asia, where 21% of newborns are affected. Low birthweight at term is also common in Middle and Western Africa, where 15% and 11% of infants are born undernourished. Data are not sufficient to prepare estimates for other parts of Africa. Levels of low birthweight at term in Central and South America and South-East Asia are much nearer those of industrialized countries, around 6%.
3. Estimates of foetal undernutrition suffer from important qualitative and quantitative constraints owing to limitations with the available data. In some regions only a small portion of infants are born in a health care facility where birthweight can be measured.
4. Foetal undernutrition is linked to chronic disease in adulthood. An investment in preventing foetal undernutrition is a highly effective investment because it not only improves maternal and infant nutrition, but may also slow down or prevent the onset of chronic disease in later life.

## Stunting

5. In 2000 it is estimated that 182 million preschool children, or 33% of children under five in developing countries, are stunted ( $< 2$  SD height-for-age) or chronically undernourished, a drop from 47% in 1980. By 2005 it is estimated that global prevalence will be further reduced to about 29%. Even so, prevalences and numbers will be extremely high.
6. The highest levels of stunting are estimated for Eastern Africa, where on average 48% of preschool children are affected in 2000, up from 47% ten years ago. This trend is further amplified by the high population growth rates in this region; hence, the number of stunted children continues to increase each year.
7. Stunting is widespread in South Central Asia, which accounts for about half of the global problem. The

trend in this region is towards improvement, but the pace of progress is too slow to meet global goals by the target date of 2015. The estimated prevalence for this region as a whole in 2000 is 44%, decreasing at a rate of 0.85 percentage points per year.

## Underweight

8. Underweight, due to chronic undernutrition or wasting or both, affects fewer children globally than stunting. However, underweight is still very widespread. In 2000 it is estimated that 27% of preschool children in developing countries are underweight ( $< 2$  SD weight-for-age). Both the prevalence and number of underweight children have declined steadily since 1980.
9. South Central Asia is the worst-affected region, with some 44% of children underweight. This translates into almost 79 million children. Prevalence and numbers continue to decline, although progress is slow.
10. Both Western and Eastern Africa have lower prevalences (37% and 36% respectively) than South Central Asia, but the situation is deteriorating. Countries of Eastern Africa are experiencing a rise in underweight of 0.55 percentage points per year, or a full 5 percentage point increase between 1990 and 2000. In Sub-Saharan Africa, 8.2 million more children are underweight now than in 1990.
11. The World Summit for Children (1990) set out a global goal of halving severe and moderate undernutrition among children under five by 2000. Only South America has achieved this goal. In this region the overall rate has decreased from 8% in 1990 to 3% in 2000. Progress has been steady and significant in South Central Asia, but the rate of progress is all too slow.

## School-Age Children

12. Height censuses conducted in Latin America show that stunting is common in school-age children in this region. In 4 of 11 countries surveyed, more than one-third of children in school are stunted. In Peru and Guatemala prevalences are 48% and 51% respectively. These rates are similar to those found in other countries in other regions. Information on the growth of school-age children that is generated in a consistent manner across countries and over time is difficult to find.

## Adolescents, Adults, and Older People

13. Information on the nutritional status of adolescents is scarce. Growth references for this age group are inadequate. Among adults, both under- and overnutrition are present in many countries in the developing world. While underweight is especially common among women in South Central Asia, both underweight and overweight are seen in African women. In the Caribbean and Latin America, overweight affects up to one in four women in all countries surveyed, except for Haiti. Very little work has been carried out on the nutritional status of older people in developing countries.

## Micronutrient Deficiencies

14. Iron nutrition needs much greater attention. Iron deficiency and its anaemia affect more than 3.5 billion people in the developing world, well over two persons out of every three. Iron deficiency impairs the cognitive development of children, causes productivity and educational losses, and increases morbidity and maternal mortality. While accurate prevalence estimates are difficult to obtain and periodically revised, all public health and nutrition experts agree that iron deficiency is a huge problem.
15. Great progress has been made in recent years towards the elimination of iodine deficiency, the most common cause of preventable mental impairment worldwide. The main thrust has been establishing and sustaining national salt iodization schemes. Effective partnerships have been forged between United Nations agencies, national and international nongovernmental organizations, and the salt industry. Globally, 68% of households in countries with iodine deficiency disorders (IDD) now consume iodized salt. The global goal of virtually eliminating IDD is within reach.
16. Although severe vitamin A deficiency (which causes blindness) is declining, subclinical deficiency still affects up to 250 million preschool children. Many more school-age children, pregnant women, and others are affected. Subclinical vitamin A deficiency contributes significantly to raised morbidity and mortality in at-risk populations. Effective, low-cost approaches to the control of vitamin A deficiency are available and are being applied in many countries.

## Breastfeeding

17. Breastfeeding rates are very high in developing countries, exceeding 95% in more than half of the countries surveyed. Breastfeeding initiation is universal in Sub-Saharan Africa, although exclusive breastfeeding is not widely practiced. Trends in median duration of breastfeeding showed positive changes between 1975 and 1996 despite demographic trends that might have had a negative influence. The role of international

and national efforts through, for example, the International Code of Marketing of Breastmilk Substitutes and the Baby Friendly Hospital Initiative are particularly impressive in this regard.

## Nutrition and Human Development

18. Recent research reaffirms the crucial contribution of good nutrition to human development. Good foetal and infant nutrition strongly promotes cognitive achievement and early school enrollment and slows down or prevents the onset of chronic diseases in later life. Community-based nutrition initiatives may also lead to a more general empowerment of communities.
19. A number of worldwide trends – such as the increasing globalization of trade, information, and financial resources; rapid urbanization; and the rapid spread of HIV/AIDS – raise important questions for the nutrition community. How can food safety standards be maintained to protect the consumer and yet maximize food trade between countries? How can urban malnutrition be addressed without damaging efforts to eliminate rural malnutrition? What are the implications of HIV/AIDS for nutrition programs? How can the new information and communications technologies be used to help reduce malnutrition?

## Human Rights

20. The emergence of human development as a guiding principle for overall development reflects a growing dissatisfaction with an exclusive reliance on economic growth as a means to improved human welfare. The focus on human capabilities has opened the door for the human rights based approach to development. The challenge now is to operationalize the principles of human rights in nutrition programming.

## Refugees and Displaced People

21. At the end of 1998 there were an estimated 12 million refugees worldwide, the majority of whom were in Africa and Asia. A further 20 million people were internally displaced. Thirteen different countries each had more than half a million displaced people. Between 1997 and 1999 there have been relatively large decreases in the numbers of refugees in Africa and Europe, due to repatriation programmes.
22. The two largest-scale displacements in 1999 were in Angola and the Balkan region. The level of wasting in the besieged cities of Angola reached 20%, whereas prevalences in the Balkans did not increase significantly. The most important explanation for this difference was the huge imbalance in assistance given.
23. Relatively high levels of stunting and new outbreaks of micronutrient deficiencies continue to be found even in some of the longer-established and better-funded refugee operations.

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# LIST OF ABBREVIATIONS

AAH	Action Against Hunger	IIH	iodine-induced hyperthyroidism
ACC/SCN	Administrative Committee on Coordination/Sub-Committee on Nutrition	ILO	International Labour Organisation
ACF	Action Contre La Faim	IMR	infant mortality rate
ADB	Asian Development Bank	INCAP	Institute of Nutrition of Central America and Panama
AED	Academy for Educational Development	IOM	International Organization for Migration
AIDS	acquired immunodeficiency syndrome	IRRI	International Rice Research Institute
ANDI	African Nutrition Database Initiative	IUGR	intra-uterine growth retardation
BFHI	Baby Friendly Hospital Initiative	IUNS	International Union of Nutritional Sciences
BMI	body mass index	IVACG	International Vitamin A Consultative Group
CAC	Codex Alimentarius Commission	JFAM	Joint Food Assessment Mission
CDC	Centers for Disease Control and Prevention	LBW	low birthweight
CEC	Commission of the European Communities	LSHTM	London School of Hygiene and Tropical Medicine
CIDA	Canadian International Development Agency	NCHS	National Center for Health Statistics
CMR	crude mortality rate	MI	Micronutrient Initiative, Ottawa
DALYs	disability-adjusted life years	MOH	Ministry of Health
DES	dietary energy supply	MoU	Memorandum of Understanding
DFID	Department for International Development	MSF	Médecins Sans Frontières
DHA	Department of Humanitarian Affairs	MUAC	mid-upper arm circumference
DHS	Demographic Health Survey	NAS	National Academy of Sciences
DRC	Democratic Republic of the Congo	NFI	Nutrition Foundation of India
EC	European Commssion	NGO	nongovernmental organization
ECOMOG	ECOWAS (Economic Community of West African States) Cease-fire Monitoring Group	NID	National Immunization Day
EHA	Emergency and Humanitarian Action	OCHA	Office of the Coordinator of Humanitarian Affairs
EMOP	Emergency Operation	ODI	Overseas Development Institute
FAO	Food and Agriculture Organization of the United Nations	OFDA	Office for Foreign Disaster Assistance
FEWS	Famine Early Warning System	OLS	Operation Lifeline Sudan
FSAU	Food Security Assessment Unit	PAHO	Pan American Health Organization
GDP	gross domestic product	PCD	Partnership for Child Development
GIEWS	Global Information and Early Warning System	PPRO	Protracted Relief and Recover Operation
GTZ	German Agency for Technical Cooperation	QIP	quick impact project
HINAP	Health Information Network for Advance Planning	RNIS	Refugee and Internally Displaced Populations Nutrition Information System
HIV	human immunodeficiency virus	SCF	Save the Children Fund
HKI	Helen Keller International	SD	standard deviation
IAEA	International Atomic Energy Agency	SMERU	Social Monitoring and Early Response Unit
ICCIDD	International Council for the Control of Iodine Deficiency Disorders	SUSENAS	National Socioeconomic Survey, Indonesia
ICH	Institute of Child Health	TSH	thyroid stimulating hormone
ICMR	Indian Council of Medical Research	U5MR	under-five mortality rate
ICRC	International Committee of the Red Cross	UNAIDS	Joint United Nations Programme on HIV/AIDS
ICRW	International Center for Research on Women	UNDP	United Nations Development Programme
IDA	iron deficiency anaemia	UNEP	United Nations Environment Programme
IDD	iodine deficiency disorders	UNESCO	United National Educational, Scientific, and Cultural Organization
IDPs	internally displaced people	UNFPA	United Nations Fund for Population Activities
IFAD	International Fund for Agricultural Development	UNHCHR	United Nations High Commissioner for Human Rights
IFLS	Indonesian Family Life Surveys	UNHCR	Office of the United Nations High Commis- sioner for Refugees
IFPRI	International Food Policy Research Institute	UNICEF	United Nations Children s Fund
IFRC	International Federation of the Red Cross and Red Crescent Societies		

UNITA	National Union for the Total Independence of Angola	USCR	United States Committee for Refugees
UNRISD	United Nations Research Institute for Social Development	USDA	United States Department of Agriculture
UNU	United Nations University	USI	universal salt iodization
USAID	United States Agency for International Development	WFP	World Food Programme
		WHO	World Health Organization
		WTO	World Trade Organization

# PREFACE

**D**ramatic changes are taking place within the nutrition community. New scientific evidence on the generational and intergenerational links between nutritional status at different stages of the life cycle is compelling. Undernourished adolescent girls and women give birth to underweight and often stunted babies. These infants are less able to learn as young children and are more likely themselves to be parents to infants with intra-uterine growth retardation and low birthweight. Moreover they are less able to generate livelihoods and are less well equipped to resist chronic disease in later life. Such life-cycle and intergenerational links demand sustained, long-term ameliorative action. In this regard, the emergence of the human rights paradigm provides powerful guidance in the formulation of appropriate policies and programmes.

Dramatic changes are also taking place in the world as we enter a new millennium. The ease with which resources – people, assets, goods, and information – can move within and across national boundaries increased dramatically in the 1990s. This globalization poses tremendous challenges for the nutrition community. It also provides tremendous opportunities for securing increased resources to reduce malnutrition.

The structure and content of the *Fourth Report* reflects these two sets of changes. All the subjects covered by the *Third Report* (1997) remain in the *Fourth Report*. New to this report are the life-cycle perspective on human nutrition and the challenges and opportunities presented by the global forces that are shaping all our lives.

Chapter 1 describes the state of nutrition in the developing world. This function remains the essence of the *World Nutrition Situation Report*. Prevalences and numbers of young child underweight, stunting, and wasting are presented with regional and sub-regional breakdowns. What is new is the addition of data from different stages in the life cycle – not just for children under five. Descriptions of foetal, school age, adolescent, adult, and elderly nutritional status are included. The reader will, however, note the paucity of high-quality data on nutritional status

for many of these groups. In general we present the available data with appropriate caveats about their overall reliability, but clearly this lack of comprehensive data is a major challenge to the nutrition community and the UN family.

Chapter 2 on micronutrients provides an update of progress in this area during 1998 and 1999. It describes advances in our understanding of the nature, causes, and consequences of various micronutrient deficiencies along with actions taken to combat them. While some new data are presented, there remains a great need for nationally representative data on the prevalence and trends in micronutrient deficiencies to inform and improve policy and programme decisions. Lessons learned, both in operational research and in the implementation of control strategies, need to continue to be documented and disseminated.

In Chapter 3, data on breastfeeding and complementary feeding are highlighted for the first time in an ACC/SCN *World Nutrition Situation Report*. While the nutrition community has understood the benefits of both for some time, this report – which focuses on the life cycle – highlights the importance of infant feeding practices as a predictor of human health into adulthood. Evidence suggests that both breastfeeding and appropriate complementary feeding lead to improved outcomes, but in a world plagued by HIV and increasing urbanization, new sets of challenges have risen for local, national, and international members of the nutrition community. While some of these challenges are being met, others represent growing threats.

Chapter 4 on nutrition and human development highlights the relevance of nutrition for the overall development process. The first part of the chapter focuses on the implications for development of recent findings in international nutrition. First, some recent evidence is presented on the strong links between infant undernutrition and cognitive development. Second, the policy implications of the emerging link between foetal undernutrition and adult chronic disease for nutrition policy are drawn out. Third, the importance of community empowerment to the overall development process is discussed, as is

the ability of community-based nutrition initiatives to empower communities beyond immediate nutrition concerns.

The second part of Chapter 4 focuses on how some of the broad changes taking place on the global stage are affecting nutrition. First, the implications of the Asian financial crisis for the design of social safety nets are discussed in the context of an Indonesian case study. Second, the implications of the increased ease with which food can be traded are discussed, together with the need for clear and enforceable food safety standards for the protection of food producers and consumers. Third, the challenges and opportunities presented to the nutrition community by the explosion in information and communications technology are considered. Fourth, the current rapid rate of urbanization poses new challenges to the nutrition community, for urban areas will challenge the preconceived notions of many in the nutrition community about what works and what does not. The last part of this section of the chapter provides an update on the spread of HIV/AIDS and the implications for the nutrition community. It is no coincidence that the region with 89% of all cases of HIV/AIDS Sub-Saharan Africa is also the only region in which the rate of undernutrition is worsening.

Finally, the chapter closes with a description of how the human rights paradigm has emerged as a potentially powerful way of analyzing and practicing development, particularly in the last 15 years. The success of the human rights based approaches in accelerating reductions in malnutrition will depend on the perceived value added they bring to communities and to the nutrition professionals working with those

communities. It is clear from the *Fourth Report* that while progress is being made in reducing malnutrition, much remains to be done. The challenge for all readers of this document is to capitalize on the potential of the powerful rights-based paradigm and to use it, along with all the other resources at our disposal, to rapidly diminish the scourge of malnutrition.

Chapter 5 is concerned with the nutrition of refugees and displaced populations. This final chapter provides an overview of the trends and developments in the humanitarian nutritional response to displacement emergencies, drawing on recent examples to highlight the problems encountered. The first section of the chapter describes the international humanitarian structures and systems involved in nutritional emergencies and their coordination. This is followed by a consideration of recent developments in assessment and early warning methodologies. The third section describes trends in food and nutrition programmes in emergency situations, including strategies to support food security, care, and the transition to self-reliance and to prevent micronutrient deficiencies. Six case studies of current displacement emergencies are then presented to illustrate the wide range of prevalences of undernutrition in displacement emergencies and response to these crises. The case studies include Angola, the Balkans region, southern Sudan, and the United Republic of Tanzania.

The chapter concludes by identifying emerging issues (policy, operational, and research) relevant to the nutrition of refugees and displaced populations. The importance of a broad problem-solving approach to assessing and responding to nutritional problems in emergencies is emphasized.

In this report the term *undernutrition* refers collectively to stunting, underweight, wasting, low body mass index, and foetal growth retardation conditions of inadequate nutrition. The term *malnutrition* refers to both undernutrition and overnutrition conditions of both deprivation and excess.

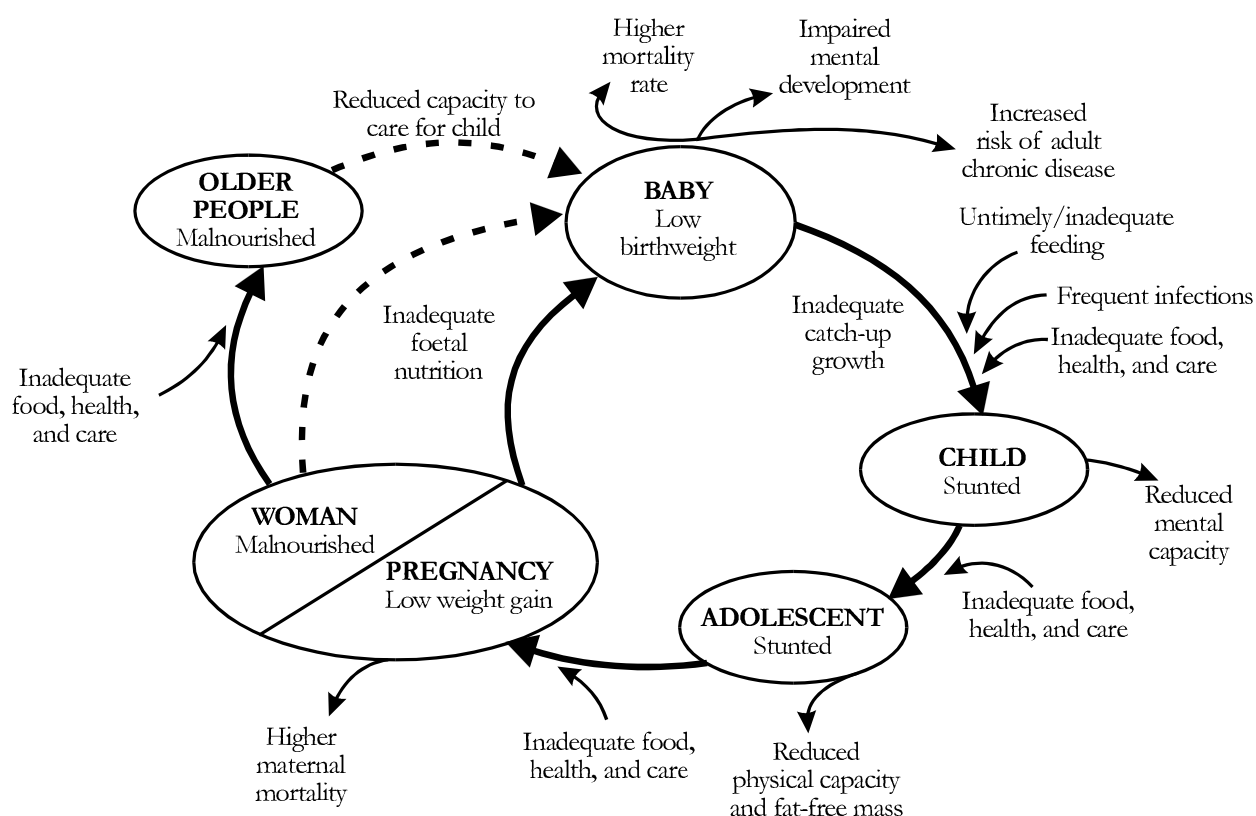
# 1 NUTRITION THROUGHOUT THE LIFE CYCLE

**N**utrition challenges continue throughout the life cycle, as depicted in Figure 1.1. Poor nutrition often starts *in utero* and extends, particularly for girls and women, well into adolescent and adult life. It also spans generations. Undernutrition that occurs during childhood, adolescence, and pregnancy has an additive negative impact on the birthweight of infants. Low-birthweight (LBW) infants who have suffered intrauterine growth retardation (IUGR) as foetuses are born undernourished and are at a far higher risk of dying in

the neonatal period or later infancy. If they survive, they are unlikely to significantly catch up on this lost growth later and are more likely to experience a variety of developmental deficits. A low-birthweight infant is thus more likely to be underweight or stunted in early life.

The consequences of being born undernourished extend into adulthood. Epidemiological evidence from both developing and industrialized countries now suggests a link between foetal undernutrition and increased risk of various adult chronic diseases – the foetal origins of disease hypothesis.<sup>1</sup>

**FIGURE 1.1 : Nutrition throughout the life cycle**



Source: Prepared by Nina Seres for the ACC/SCN-appointed Commission on the Nutrition Challenges of the 21<sup>st</sup> Century.



During infancy and early childhood, frequent or prolonged infections and inadequate intakes of nutrients – particularly energy, protein, vitamin A, zinc, and iron – exacerbate the effects of foetal growth retardation. Most growth faltering, resulting in underweight and stunting, occurs within a relatively short period – from before birth until about two years of age.

Undernutrition in early childhood has serious consequences. Underweight children tend to have more severe illnesses, including diarrhoea and pneumonia. There is a strong exponential association between the severity of underweight and mortality.<sup>2</sup> It has been estimated that out of 11.6 million deaths that occurred in 1995 among children under five in developing countries, 6.3 million (54%) were associated with low weight-for-age. The majority of these deaths can be attributed to the potentiating effect of mild to moderate undernutrition.<sup>3</sup>

The nutrition and health of school-age children in developing countries have only recently begun to receive attention. A long-standing assumption has been that by school age a child has survived the most critical period and is no longer vulnerable. However, many of the infectious diseases affecting preschool children persist into the school years. Until recently, data on the nutritional status of school-age children were not routinely collected, despite growing evidence, first, that malnutrition was widespread in this age group, and second, that these nutritional problems adversely affect school attendance, performance, and learning.

In adolescence, a second period of rapid growth may serve as a window of opportunity for compensating for early childhood growth failure, although the potential for significant catch-up at this time is limited. Also, even if the adolescent catches up on some lost growth, the effects of early childhood undernutrition on cognitive development and behaviour may not be fully redressed.<sup>4</sup> A stunted girl is thus most likely to become a stunted adolescent and later a stunted woman. Apart from direct effects on her health and productivity, adult stunting and underweight increase the chance that her children will be born with low birthweight. And so the cycle turns.

It is imperative to prevent foetal and early childhood undernutrition. Nutrition interventions in pregnancy and early childhood can result in improvements in body size and composition in adolescents and young adults. Improvements in both physical and intellectual performance were also found in a study by the Institute for Nutrition for Central America and Panama (INCAP).<sup>5</sup>

Investing in maternal and childhood nutrition will have both short- and long-term benefits of huge economic and social significance, including reduced health care costs throughout the life cycle, increased educability and intellectual capacity, and increased adult productivity. No economic analysis can fully capture the benefits of such sustained mental, physical, and social development.

The life cycle provides a strong framework for discussing the challenges facing human nutrition. Although information is available on preschool children in most regions, the paucity of data for other age groups precludes sub-regional and regional descriptions of the nutritional problems faced at these periods of the life cycle.

The causes of malnutrition are complex. Underlying the immediate causes of malnutrition will be a failure of either the main food, health, or care preconditions for good nutrition. The widely used food-health-care conceptual framework, shown in Appendix 1, offers an analytical tool for portraying causes of malnutrition and is used throughout this report.

For the most part, the results in this *Fourth Report* are presented according to the regions and sub-regions defined by the United Nations Population Division. A listing of the countries within each sub-region is provided in Appendix 2. These sub-regions are different from those used by the ACC/SCN since 1987. The objective of this change is to help standardize the use of common regions and sub-regions among UN agencies. WHO began to use this classification in 1993. Data described in this chapter derive from stable national populations. The nutritional status of refugees and internally displaced populations is described in Chapter 5.

## 1.1 Intrauterine Growth Retardation (IUGR)

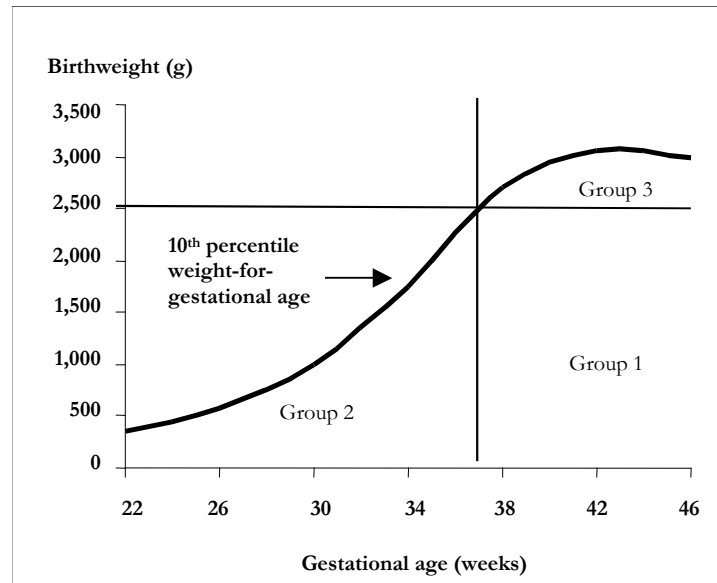
IUGR refers to foetal growth that has been constrained by an inadequate nutritional environment *in utero* and, thus characterizes a newborn that has not attained its growth potential. These infants are disadvantaged before they enter the world. Although the classification of IUGR is still based on insufficiently standardized reference data,<sup>6</sup> there are three distinct groups, as depicted in Figure 1.2. The reference curve in this figure is the 10<sup>th</sup> percentile of a reference population and takes into account gestational age.

Newborns in Group 1 are born after at least 37 weeks of gestation and weigh less than 2,500 g

at birth. In most populations this is the largest group of newborns affected by intrauterine growth retardation. Group 2 newborns are preterm and weigh less than the 10<sup>th</sup> percentile at birth. Newborns in Group 3, a smaller group, weigh less than the 10<sup>th</sup> percentile (fall below the curve) but have a birthweight greater than 2,500 g.

In most circumstances in developing countries, it is not possible to determine the gestational age of an infant. Also, reference curves adjusted for gestational age are not widely employed. Therefore, low birthweight (< 2,500 g) is often used as a proxy for IUGR. Incidence rates of low birthweight help to characterize nutritional status during foetal life for populations, but they do not go far enough. This is because the incidence of low birthweight among *preterm* infants will overestimate poor growth due to nutritional causes (Group 2). On the other hand, incidence rates of low birthweight among *term* infants will underestimate poor growth due to nutritional causes in term infants because not all infants falling below the 10<sup>th</sup> percentile reference curve are captured (that is, Group 3). In this report we focus on the largest group of IUGR infants, those in Group 1, because this is the only group for which reasonably good data are available.

**FIGURE 1.2 : Different types of intrauterine growth retardation (IUGR)**



Source: Adapted from 7.

populations. Population-wide interventions aimed at preventing foetal growth retardation are urgently needed in many developing countries.

Low birthweight at term is especially common in South Central Asia, where 20.9% of newborns are affected; this sub-region accounts for about 80% of all affected newborns worldwide. Low birthweight is also common in Middle and Western Africa, where 14.9% and 11.4% of infants have low birthweight at term, respectively. Data are not sufficient to prepare estimates for other parts of Africa. Low birthweight at term is less common in Latin America and the Caribbean than in other parts of the developing world. Incidence rates average 6.5% for this region as a whole and 6.2% for South America.

In all regions the total number of newborns with IUGR is higher than the number affected by low birthweight. IUGR, defined as all newborns falling below the reference curve in Figure 1.2, probably affects about 24% or approximately 30 million newborns per year in developing countries.<sup>b,7</sup>

These estimates suffer from important qualitative and quantitative constraints owing to limitations of the available data. In some regions only a small proportion of infants are born in a health care facility where birthweight can be measured. However,

## Comparing Prevalences and Numbers

Table 1.1 presents a picture of IUGR globally and by region, as far as available data permit. (Statistical methods are described in Appendices 3 and 4.) In the year 2000 it is estimated that 11.0% of newborns in developing countries, or 11.7 million infants, have low birthweight at term.<sup>a</sup> These children are born undernourished with little chance of fully catching up. This is a major global human development problem with profound short- and long-term consequences for individuals, communities, and whole

<sup>a</sup> Low birthweight at term is also referred as IUGR-LBW in some publications.

<sup>b</sup> This estimate is based on total live births for 1995.

**TABLE 1.1 : Estimated incidence of low birthweight and expected number of affected newborns, 2000**

UN regions and sub-regions	LBW (Groups 1 and 2) <sup>a</sup>		LBW at term (Group 1) <sup>a</sup>	
	Incidence (%)	Number (thousand)	Incidence (%)	Number (thousand)
<i>Africa</i>	<i>n/a</i>	<i>n/a</i>	<i>n/a</i>	<i>n/a</i>
Eastern	n/a	n/a	n/a	n/a
Middle	21.3	853	14.9	597
Northern	n/a	n/a	n/a	n/a
Southern	n/a	n/a	n/a	n/a
Western	17.2	1,451	11.4	962
<i>Asia<sup>b</sup></i>	<i>18.0</i>	<i>13,774</i>	<i>12.3</i>	<i>9,344</i>
Eastern <sup>b</sup>	5.8	1,250	1.9	409
South Central	28.3	10,917	20.9	8,062
South-East	10.3	1,190	5.6	647
Western	8.3	417	4.5	226
<i>Latin America and the Caribbean</i>	<i>11.5</i>	<i>1,329</i>	<i>6.5</i>	<i>755</i>
Caribbean	11.7	91	6.7	52
Central America	12.3	422	7.2	247
South America	11.1	816	6.2	456
<i>Oceania<sup>c</sup></i>	<i>15.0</i>	<i>29.2</i>	<i>9.8</i>	<i>19</i>
Melanesia	15.4	29	9.9	19
Micronesia	n/a	n/a	n/a	n/a
Polynesia	4.0	0.2	0.2	0.03
<i>All developing countries<sup>d</sup></i>	<i>16.4</i>	<i>17,436</i>	<i>11.0</i>	<i>11,677</i>

Sources: 8 (incidence of LBW); 7 (incidence of LBW at term). Number of newborns affected was obtained by applying incidence estimates to the total number of live births, obtained from 9.

Notes: Data for LBW and LBW at term refer to birthweights < 2,500 g. n/a = not available because coverage of live births < 80%.

<sup>a</sup> Groups defined in Figure 1.2.

<sup>b</sup> Excludes Japan.

<sup>c</sup> Excludes Australia and New Zealand.

<sup>d</sup> Weighted average of incidences in each country

the estimates represent a valid attempt to quantify the magnitude and geographical distribution of foetal undernutrition for advocacy and public health purposes. The limitations point to the need to improve the availability and quality of gestational age and birthweight data.

## Causes

In developing countries, the major determinants of growth retardation *in utero* are nutritional: inadequate maternal nutritional status before conception, short maternal stature (principally due to undernutrition and infection during childhood), and poor maternal nutrition during pregnancy (low gestational weight gain, primarily due to inadequate dietary intake). Maternal nutrition during pregnancy is especially important. Low pregnancy weight gain may account for more than 14% of growth retardation *in utero*; further, in populations

with a high prevalence of short stature, low maternal height accounts for about 18.5%.<sup>10</sup> Prevalence rates are high where pre-pregnancy weight-for-height is low undernourished women obtain a greater benefit than other women from a given gestational weight gain.<sup>11</sup>

Diarrhoeal diseases, intestinal parasitosis, and respiratory infections are common in developing countries and may also have an important impact on IUGR. These illnesses may be associated with an impaired foetal growth of, on average, 45 g per birth.<sup>12</sup> Where it is endemic, malaria is a major determinant of IUGR. Infants born to women with placental malaria have a mean deficit in birthweight of about 170 g.<sup>13</sup> Furthermore, the effects of cigarette smoking are becoming a significant factor in some developing countries.<sup>14</sup>

The immediate causes of IUGR often operate simultaneously with more deeply rooted underlying and basic causes. These causes relate to the care of

women, access to and quality of health services, environmental hygiene and sanitation, household food security, educational status, and poverty.

In industrialized countries, cigarette smoking is the most important determinant of IUGR, followed by low gestational weight gain and low pre-pregnancy body mass index.<sup>12</sup> The etiological roles of pre-eclampsia, short stature, genetic factors, and alcohol and drug use during pregnancy are well established but are quantitatively less important. In industrialized countries, the contribution of socioeconomic factors to IUGR incidence remains unknown after controlling for the factors discussed above.<sup>14</sup>

The etiological roles of micronutrients in IUGR remain to be clarified in developing and industrialized countries. Some have argued that randomized trials are required to define the possible effects of folate, iron, calcium, vitamins D and A, magnesium, and zinc, especially in developing countries.<sup>15</sup> Others argue that the use of multiple vitamin and mineral supplements by women in developing countries is an important strategy to improve micronutrient status and benefit women's health, pregnancy outcome, and child health.<sup>16</sup> The NAS suggests that a strategy to promote increased consumption of multiple micronutrients simultaneously would be more effective than the promotion of a select few.<sup>17</sup>

## Consequences

It has been estimated that for term infants weighing 2,000–2,500 g at birth, the risk of neonatal death is four times higher than for infants weighing 2,500–3,000 g, and ten times higher than for infants weighing 3,000–3,500 g.<sup>18</sup> In developing countries with a high prevalence of low weight at birth, IUGR infants account for the majority of neonatal deaths. Although the association between IUGR and increased mortality is strongest during the immediate neonatal period (seven days), it extends beyond this time. Furthermore, there is an increased risk of diarrhoea in term infants below 2,500 g and an increased risk of pneumonia in IUGR infants in developing countries.<sup>18</sup>

IUGR has significant long-term consequences on body size, composition, and muscle strength. IUGR newborns in industrialized countries partially catch up relative to controls during the first two years of life. However, this is usually not enough to compensate for prenatal growth retardation. These infants will be about 5 cm shorter and 5 kg lighter in adulthood.<sup>19–21</sup> In Guatemala, IUGR newborns also showed partial catch-up during the first two years of life and then

maintained their achieved place in the growth distribution. Guatemalan IUGR infants were shorter, lighter, and weaker than non-IUGR controls as adolescents and young adults and were also about 5 cm shorter and 5 kg lighter as adults.<sup>22</sup>

Some, but not all, studies evaluating neurodevelopmental outcomes in IUGR infants have shown the presence of neurological dysfunction, particularly in males of low socioeconomic status. Neurological dysfunction is associated with attention deficits, hyperactivity, clumsiness, and poor school performance.<sup>23</sup> The effects on cognitive development and behaviour in the first six years of life are still unclear, although deficits in cognition have been found in children with very low birthweights.<sup>24</sup>

Most immune functions have been shown to be impaired in IUGR infants. The greater the foetal growth retardation, the greater the impairment of the immune competence. This impairment may be sustained through childhood.<sup>25–27</sup> One study links disproportionate foetal growth to altered immunoglobulin E concentrations in adult life,<sup>28</sup> and another links it to autoimmune thyroid disease.<sup>29</sup>

There is evidence of associations between retarded foetal growth and blood pressure, noninsulin-dependent diabetes, coronary heart disease, and cancer in adult life. Barker's foetal origins of disease hypothesis posits that nutritional insults during critical periods of gestation and early infancy, followed by relative affluence, increase the risks of chronic diseases in adulthood as described in Box 1.1.<sup>1</sup> The nutrition transition—that is, the shifts in dietary patterns and lifestyle that have resulted from urbanization and rapid economic development—may accelerate the emergence of adult consequences of early undernutrition.<sup>30</sup>

## 1.2 Undernutrition in Preschool Children

This section describes the estimated prevalence and number of preschool (under five years old) children suffering from stunting, underweight, and wasting at global, regional, and sub-regional levels.

### Defining Indices and Indicators

- **Stunting.** The anthropometric index height-for-age reflects linear growth achieved pre- and postnatally with its deficits indicating long-term, cumulative effects of inadequate nutrition and/or health. Shortness in height refers to low height-for-age that may reflect either normal

BOX 1.1

## The Foetal Origins of Disease

*Genes provide a general recipe for making a human being, but the human being is determined by the ingredients provided by the mother.*

David Barker

**T**he foetal origins of adult disease hypothesis originated in the 1980s when Professor David Barker of the University of Southampton noted a link between low birthweight and the incidence of cardiovascular disease among middle-aged men and women born in the United Kingdom. More than 30 studies around the world have indicated that low-birthweight term infants have a higher incidence of hypertension later in life than those with a normal birthweight, independent of adult social class and other adult risk factors as smoking, drinking, and overeating. Low birthweight, as well as thinness at birth, has also been correlated with glucose intolerance in childhood and noninsulin-dependent diabetes in later life.

In one stark example, semi-starved Dutch women in the closing stages of World War II gave birth to children who as adults were especially vulnerable to diabetes, high blood pressure, and coronary heart disease. This relationship was found to be particularly strongly associated with pregnancies that were subjected to food shortages in the third trimester of pregnancy.

The Barker hypothesis posits that maternal dietary imbalances at critical periods of development *in utero* can trigger an adaptive redistribution of foetal resources, including growth retardation. Such adaptations affect foetal structure and metabolism in ways that predispose the individual to later cardiovascular and endocrine diseases. The correlation between low birthweight and later cardiovascular disease and

diabetes may arise from the fact that nutritional deprivation *in utero* programmes a newborn for a life of scarcity. Problems arise when the child's system is later confronted by a world of plenty.

Recent studies have shown a link with immune system development and subsequent risk of infection-related mortality in adulthood. A 1997 analysis of over a thousand deaths in one Gambian community has shown that infants born in the wet season were ten times more likely than infants born in the dry season to die prematurely in adulthood, mainly from infections. The difference was manifested only after adolescence. This phenomenon may be due to abnormal growth of the thymus gland (immune cell producer) or the lymph system (immune cell transporter) during pregnancy.<sup>31</sup>

With regard to future research, there is a need to progress beyond epidemiological associations to greater understanding of the cellular and molecular processes that underlie them. We need to know what factors limit the delivery of nutrients and oxygen to the human foetus, how the foetus adapts to a limited supply, how these adaptations programme the structure and physiology of the body, and by what molecular mechanisms nutrients and hormones alter gene expression. Further research requires a strategy of interdependent clinical, animal, and epidemiological studies.

The foetal origins of disease provide even greater justification for prioritizing nutrition of girls and women, for avoiding *in utero* and *post utero* nutritional imbalances, and for smoothing nutrition transitions. Essentially it calls for a long-term life cycle approach to nutrition improvement. ■

variation in growth or a deficit in growth. Stunting refers to shortness that is a deficit or linear growth that has failed to reach genetic potential as a result of poor diet and disease. Stunting is defined as low height-for-age at  $< 2$  standard deviations (SD) of the median value of the National Center for Health Statistics/World Health Organization (NCHS/WHO) international growth reference.<sup>2</sup> Severe stunting is defined as  $< 3$  SD.

- **Underweight.** The anthropometric index weight-for-age represents body mass relative to age. Weight-for-age is influenced by the height and weight of a child and is thus a composite of stunting and wasting, making interpretation of this indicator difficult. In the absence of wasting, both weight-for-age and height-for-age reflect the long-term nutrition and health experience of the individual or population. Underweight refers

to a deficit and is defined as low weight-for-age at  $< 2$  SD of the median value of the NCHS/WHO international reference.<sup>2</sup>

- **Wasting** describes a recent and severe process that has produced a substantial weight loss, usually as a consequence of acute shortage of food and/or severe disease. Chronic dietary deficit or disease can also lead to wasting. The anthropometric index weight-for-height reflects body weight relative to height. Wasting refers to low weight-for-height at  $< 2$  SD of the median value of the NCHS/WHO international weight-for-height reference. Severe wasting is defined as  $< 3$  SD. The statistically expected prevalence of wasting (as with underweight and stunting) is between 2 and 3%, given the normal distribution of wasting rates.<sup>2</sup> This indicator is used extensively in emergency settings.

#### BOX 1.2

### A Growth Curve for the 21st Century

**I**nfants fed according to WHO recommendations and living in conditions that favour the achievement of genetic growth potential grow less rapidly than the NCHS/WHO International Growth Reference,<sup>2</sup> particularly after 4–6 months. A significant discrepancy of approximately half a standard deviation in estimated height status arises immediately before and after 24 months of age. The distributions of weight-for-age and weight-for height are skewed, reflecting a substantial level of childhood obesity. These drawbacks led a WHO Expert Committee on Physical Status in 1995 to recommend the development of a new growth reference.

A multicountry growth reference study specifically designed for this purpose was launched in 1997. Depending on the availability of funds, data collection is expected to be complete in 2003. The study is being undertaken in seven countries in diverse geographical areas, using samples of infants and children whose caregivers

follow recognized health recommendations.<sup>32</sup> The research design combines a longitudinal study from birth to 24 months of age of 300 newborns per country, with a cross-sectional study of 1,400 children aged 18–71 months per site. More than 13,000 healthy infants and children will be involved in the study.

The new international growth reference will achieve several aims. Most important, it will provide a scientifically reliable descriptor of physiologic growth and a powerful tool for child health advocates. This will be achieved by applying the highest scientific rigor in a complex field-based project. Another objective will be to stress that human growth during the first five years of life is very similar across groups of children of different ethnic backgrounds. Equally important, the new growth reference will set growth of the breastfed infant as the standard to match. Future prevalence estimates based on the new reference will clearly be affected to the extent that the new reference differs from the current one. ■

## Comparing Prevalences and Numbers

Table 1.2 and Table 1.3 show the estimated prevalences and numbers of stunted and underweight children, respectively, for the UN regions and sub-regions.<sup>c</sup> Multilevel modelling the same statistical method described in the *Third Report* was used for this report to develop the trend projections for both stunting and underweight. These tables were prepared for the ACC/SCN by the Department of Nutrition for Health and Development of WHO. All survey data were taken from the WHO Global Database on Child Growth and Malnutrition.<sup>33</sup> The latest available national prevalence rates appear in Appendix 5. The national survey data are of variable quality, and some surveys are more than ten years old.

Data were available from at least one survey for 107 countries for the estimation of stunting prevalences and from 108 countries for the estimation of underweight prevalences. Data were available from at least two surveys for 65 countries for estimation of trends in stunting. For trends in underweight, data were available from two surveys for 68 countries. There are no differences in prevalence rates for

boys and girls for stunting, underweight, or wasting, so results are not disaggregated by gender.

Estimates of the numbers of undernourished preschool children were derived by applying the estimated prevalences to the estimated total preschool population for each region and sub-region taken from UN population projections.<sup>9</sup> Thus, estimates of numbers cover all countries within regions, including those that did not have a survey to contribute to the prevalence estimate.

## STUNTING

In 2000, it is estimated that 32.5% of children under five in developing countries are stunted. There has been a steady improvement since 1980 when the estimated global prevalence was nearly one half (47.1%). By 2005, the estimated global prevalence will be further reduced to about 29.0%. Still, the numbers are extremely high. Some 182 million preschool children will be stunted in 2000, decreasing to about 165 million in 2005. More than two-thirds (70%) of these children live in Asia (of which 61% are in South Central Asia), while some 24% live in Sub-Saharan Africa.

**TABLE 1.2 : Estimated prevalence and number of stunted children, 1980–2005**

UN regions and sub-regions	Prevalence of stunting (%)						Number stunted (million)					
	1980	1985	1990	1995	2000	2005	1980	1985	1990	1995	2000	2005
<i>Africa</i>	40.5	39.2	37.8	36.5	35.2	33.8	34.78	38.51	41.68	44.51	47.30	49.40
Eastern	46.5	46.9	47.3	47.7	48.1	48.5	12.88	14.83	17.13	19.28	22.03	24.41
Northern	32.7	29.6	26.5	23.3	20.2	17.0	6.01	6.01	5.55	4.90	4.44	3.86
Western	36.2	35.8	35.5	35.2	34.9	34.6	9.04	10.51	11.99	13.47	14.74	16.03
<i>Asia</i>	52.2	47.7	43.3	38.8	34.4	29.9	173.37	169.72	167.66	143.49	127.80	110.19
South Central	60.8	56.5	52.2	48.0	43.7	39.4	89.36	93.45	93.36	83.62	78.53	72.28
South-East	52.4	47.5	42.6	37.7	32.8	27.9	27.71	26.47	24.24	21.51	18.94	15.78
<i>Latin America and the Caribbean</i>	25.6	22.3	19.1	15.8	12.6	9.3	13.19	11.87	10.38	8.59	6.82	5.11
Caribbean	27.1	24.4	21.7	19.0	16.3	13.7	0.92	0.86	0.81	0.71	0.61	0.51
Central America	26.1	25.6	25.0	24.5	24.0	23.5	3.87	3.81	3.87	3.94	3.92	3.82
South America	25.1	21.1	17.2	13.2	9.3	5.3	8.38	7.35	6.05	4.55	3.16	1.84
<i>Oceania</i>	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
<i>All developing countries</i>	47.1	43.4	39.8	36.0	32.5	29.0	221.35	220.10	219.73	196.59	181.92	164.70

Source: 34.

Notes: Stunting is defined as low height-for-age at < 2 standard deviations of the median value of the NCHS/WHO international growth reference. n/a = not available.

<sup>c</sup> The majority of the estimated prevalences cannot be compared with those published in the *Third Report* because of the different composition of regions. However, the estimated prevalence for all developing countries and for South America can be compared with the *Third Report*. In both cases, the confidence intervals of the estimates do include the midpoint estimates; thus there is consistency between the two reports.

As previously reported,<sup>35</sup> levels of stunting vary across regions. The highest levels of stunting are estimated for Eastern Africa, where on average 48.1% of preschool children are affected in 2000. This region includes Ethiopia, where a national survey in 1992 found that 64.2% were stunted. National surveys in Malawi (1995) and Zambia (1996/97) found stunting prevalences of 48.3% and 42.4%, respectively. In Eastern Africa, stunting is increasing at 0.08 percentage points per year. This trend, together with high population growth rates, translates into larger numbers of East African children stunted each year. Over the period 2000 to 2005, numbers are expected to increase from about 22 to 24.4 million preschool children stunted.

Although stunting is widespread in South Central Asia, the trend in this region is towards improvement. South Central Asia includes Afghanistan, Bangladesh, India, and Pakistan, which all have high levels of child undernutrition. Central Asian countries, formerly part of the Soviet Union, are also included in this region. These countries report surprisingly high prevalences of stunting: Kyrgyzstan, 24.8% in 1997, and Uzbekistan, 31.3% in 1996. The estimated prevalence for South Central Asia as a whole in 2000 is 43.7%. This rate is decreasing by 0.85 percentage points per year. The number of stunted children declined over the 1990s. If this trend continues, about 6.25 million fewer children will be stunted in South Central Asia by 2005 compared with 2000.

The Western African sub-region has a much lower estimated prevalence than either Eastern Africa or South Central Asia: 34.9% in 2000. However, the prevalence has stagnated over recent years, and population numbers are increasing. The number of stunted children in this region therefore continues to rise. Between 2000 and 2005, the number of stunted children will increase by about one and a half million. To a large extent the trend in this sub-region will be driven by Nigeria, which has by far the largest child population in this group of countries. For Southern Africa, the sub-regional prevalence of stunting is 23.7%, according to surveys carried out in Lesotho, Namibia, and South Africa.<sup>d</sup> It was not possible to estimate a trend for this sub-region, owing to lack of repeated surveys. National prevalences documented in the most recent surveys available for four of the five countries in this sub-region range from 22.5% in South Africa (1994–95) to 44% in Lesotho (1996).

About one-third (32.8%) of South-East Asian preschool children are stunted in 2000. This region has been experiencing the highest rate of improvement, at 0.98 percentage points per year, or a 10-percentage-point reduction between 1990 and 2000. This means that the number of children stunted is falling steadily and will continue to do so; it is projected to drop by more than 3 million between 2000 and 2005. Still, some 19 million children in this region are stunted in 2000. The effects of the financial crisis in this region are discussed in section 4.2.

About one in five preschool children in Northern Africa is stunted, translating into some 4.4 million children. The steady decline in both prevalences and numbers is forecast to continue, resulting in a 3-percentage-point decline between 2000 and 2005. This region comprises seven North African countries, as well as the Sudan. (There are about 4 million internally displaced persons in the Sudan, families normally not reached during national nutrition surveys.) Egypt, with the largest child population in this sub-region, may drive the overall pattern of improvement in the coming years for this group of countries. The most recent survey in Egypt (1997–98) shows that about 24.9% of preschool children are stunted.

The estimated prevalence for Latin America and the Caribbean as a whole (12.6%) continues to decline, by an average of 0.79 percentage points per year in South America. By 2005 only 5.3% of South American preschool children will be stunted. As discussed later in this report, undernutrition is being replaced by overweight in some South American countries. Central America, however, has an estimated prevalence of 24.0% and no significant improvement forecast over the next five years. Indeed the numbers of stunted children in Central America have remained about constant from 1980 to 2000.

## UNDERWEIGHT

Underweight, due to chronic undernutrition or to wasting or to both, affects fewer children globally than stunting. However, underweight is still widespread among developing-country children. In 2000 it is estimated that 26.7% of preschool children in developing countries are underweight. Underweight has declined steadily since 1980, when 37.4% of the world's preschool children were underweight. The global

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<sup>d</sup> This sub-regional prevalence is based on survey data, not on the model employed for all other estimates, because there is insufficient recent survey coverage in this sub-region.



**TABLE 1.3 : Estimated prevalence and number of underweight preschool children, 1980–2005**

UN regions and sub-regions	Prevalence of underweight (%)						Number underweight (million)					
	1980	1985	1990	1995	2000	2005	1980	1985	1990	1995	2000	2005
<i>Africa</i>	26.2	26.7	27.3	27.9	28.5	29.1	22.47	26.30	30.11	34.03	38.32	42.45
Eastern	24.9	27.7	30.4	33.2	35.9	38.7	6.92	8.76	11.03	13.42	16.47	19.48
Northern	17.5	16.4	15.6	14.8	14.0	13.2	3.22	3.32	3.27	3.11	3.08	2.99
Western	30.1	31.7	33.3	34.9	36.5	38.1	7.51	9.29	11.23	13.34	15.41	17.66
<i>Asia</i>	43.9	40.2	36.5	32.8	29.0	25.3	145.95	142.95	141.31	121.03	107.91	93.16
South Central	58.1	54.5	50.9	47.3	43.6	40.0	85.35	90.06	90.90	82.40	78.49	73.48
South-East	43.5	39.9	36.2	32.6	28.9	25.3	23.00	22.21	20.60	18.56	16.68	14.27
<i>Latin America and the Caribbean</i>	14.2	12.2	10.2	8.3	6.3	4.3	7.32	6.50	5.57	4.48	3.40	2.35
Caribbean	22.9	20.1	17.2	14.4	11.5	8.7	0.78	0.71	0.65	0.54	0.43	0.32
Central America	15.1	15.2	15.2	15.3	15.4	15.4	2.24	2.26	2.36	2.46	2.52	2.51
South America	13.2	10.7	8.2	5.7	3.2	2.3	4.40	3.71	2.88	1.96	1.08	0.80
<i>Oceania</i>	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
<i>All developing countries</i>	37.4	34.7	32.1	29.2	26.7	24.3	175.74	175.75	176.99	159.55	149.63	137.95

Source: 34.

Notes: Underweight is defined as low weight-for-age at &lt; 2 standard deviations of the median value of the NCHS/WHO international growth reference. n/a = not available.

prevalence will reach 24.3% by 2005. Global numbers will decrease from 150 million to 138 million between 2000 and 2005. The majority of underweight children (52%) live in South Central Asia.

South Central Asia is the worst affected sub-region, with some 43.6% of children underweight. This translates into almost 79 million children underweight. However, prevalence and numbers continue to decline. By 2005 the estimated prevalence will drop a further 3.6% to 40.0%. The number of underweight children has been decreasing since about 1990 and is expected to continue. By 2005 some 5 million fewer children will be underweight.

Both Western and Eastern Africa have lower prevalences (36.5% and 35.9% respectively) than South Central Asia, but the situation is deteriorating. Countries of Eastern Africa are experiencing a rise in underweight of 0.56 percentage points per year, or a full 5-percentage-point increase between 1995 and 2005. During this period numbers have increased by about 6 million. The trend in Eastern Africa is very worrying. Western Africa has seen an increase of 0.32 percentage points per year in recent years. The increase in underweight among Western African children is explained in part by the high rates of wasting in this region, discussed below.

There is much less underweight among North African children (14.0%). This region is more similar to the Caribbean (11.5%) and Central America (15.4%) than to either Africa or Asia. Underweight in South

America will have been eliminated by 2005, when the regional prevalence estimate reaches 2.3%. Similar progress is not being achieved in Central America, where there has been no improvement over the past 20 years in either prevalence or numbers. In South-East Asia the estimated prevalence, which has been falling steadily since 1980, is forecast to decrease further by 2005 to 25.3%. Still, some 14 million children in South-East Asia will be underweight.

The World Summit for Children set a global goal of halving severe and moderate malnutrition among children under five between 1990 and 2000. Our analysis indicates that only South America will have achieved this goal. In this region the overall rate has decreased from 8.2% in 1990 to 3.2% in 2000. Progress has been steady and significant in South Central Asia (from 50.9% to 43.6%), but the rate of progress is all too slow. Northern Africa, with higher mean household incomes, has seen very slow progress, from 15.6% to 14.0%. In other parts of Africa, 8.4 million more children are underweight now than in 1990.

## WASTING

An estimated 50 million preschool children were wasted in 1995 (Table 1.4). Wasting is not as common as stunting or underweight in any region; the global prevalence is about 9.4%. Wasting rates can change rapidly, however, especially in situations of emergency food shortage and population displacement. This is discussed further in section 5.1.

**TABLE 1.4 : Prevalence and number of wasted preschool children, 1995**

UN regions and sub-regions	Survey countries/ total countries <sup>a</sup>	Population covered by surveys (%)	Prevalence of wasting (%)	Number wasted (million)
<i>Africa</i>	<i>43/53</i>	<i>94.5</i>	<i>9.6</i>	<i>11.06</i>
Eastern	16/17	95.8	7.0	2.74
Middle	5/9	84.6	8.6	1.36
Northern	6/6	99.8	7.2	1.46
Southern	4/5	95.9	2.9	0.17
Western	12/16	94.2	15.6	5.33
<i>Asia</i>	<i>31/46</i>	<i>93.7</i>	<i>10.4</i>	<i>37.87</i>
Eastern	2/4	94.4	3.4	3.73
South Central	12/14	99.2	15.4	27.27
South-East	5/10	84.0	10.4	5.75
Western	12/18	70.7	5.1	1.12
<i>Latin America and the Caribbean</i>	<i>21/31</i>	<i>97.2</i>	<i>2.9</i>	<i>1.59</i>
Caribbean	4/13	64.8	n/a	n/a
Central America	7/8	99.8	4.9	0.79
South America	10/12	99.6	1.8	0.64
<i>Oceania</i>	<i>n/a</i>	<i>n/a</i>	<i>n/a</i>	<i>n/a</i>
<i>Developing countries</i>	<i>99/147</i>	<i>94.1</i>	<i>9.4</i>	<i>50.59</i>

Source: 34.

Notes: Wasting is defined as low weight-for-height at < 2 standard deviations of the median value of the NCHS/WHO international growth reference. n/a = not available because of insufficient data.

<sup>a</sup> Number of countries that have national surveys out of the total number of countries for each sub-region.

These updated results are similar to those published by WHO in 1997,<sup>e</sup> but there has been a substantial increase in wasting among Western African children. This increase helps explain the high rates of underweight in these countries. Western Africa and South Central Asia have the highest prevalences of wasting (both about 15.5%) followed by South-East Asia (10.4%). Central America presents low levels, and South America and Southern Africa are close to the statistically expected prevalence, implying that wasting is not common in these children.

## Exploring the Changes in Preschool Nutrition in Sub-Saharan Africa

The region that has seen the least overall improvement in the nutritional status of its children is Sub-Saharan Africa, where one-half of the 25 countries with more than one national survey indicated a rise in stunting rates.<sup>35</sup>

What explains the differential progress across countries in reducing child malnutrition and the slow progress of this region as a whole? The causes of child malnutrition are complex, multidimensional, and interrelated, ranging from factors as fundamental as political instability and slow economic growth to those as specific in their manifestation as respiratory infection and diarrhoeal disease. This is well illustrated by the framework in Appendix 1. Determinants also differ considerably across geographical areas. Nonetheless, using cross-country regression analysis it is possible to gain a general sense of the relative importance and contribution of some broad causal factors for the developing world as a whole. A recent study undertook such an analysis using national underweight prevalence rates collected from 1970 to 1995 for children under five years of age.<sup>36</sup> This IFPRI study, which is described in Appendix 6, found that women's educational and social status, national per capita food availability, and access to

<sup>e</sup> In 1997, WHO reported sub-regional, regional, and global estimates for the prevalence and number of wasted children under five years old for 1995.<sup>33</sup> These estimates were derived from nationally representative data using a weighted prevalence approach for sub-regions where the proportion of children covered by national surveys was at least 70%. For this *Fourth Report*, WHO has updated these 1995 estimates on the basis of recent data (as of June 1999), although the median survey year for the countries that have nationally representative data does not permit an estimate beyond 1995.

safe water were important underlying determinants of child nutritional status at a global level.

In a further analysis for Sub-Saharan Africa, countries for which data over time were available for some portion of the 1970 to 1995 period were divided into two groups: (1) those with periods of decreased prevalence (improving) and (2) those with periods of increased underweight prevalence (deteriorating). Appendix 7 lists the countries and time periods.

Table 1.5 reports the differences across the two groups in underweight rates and in the factors identified as important determinants of underweight in the preceding global analysis. The average decrease in underweight prevalence for the improving group is 5.5 percentage points, while the average increase for the deteriorating group is 6.0 percentage points. When the intergroup differences among the potential determinants were examined, two were found to be statistically significant: differences in women's relative status and in per capita dietary energy supply.

The proxy variable for women's relative status—the ratio of female life expectancy to male life expectancy—actually declined for both groups, but the decline for the deteriorating group was five times larger than that for the improving group. One would expect such declines in women's relative status to have had a negative impact on child

nutrition for both groups, wiping out some of the gains made through improvements in the other factors considered. Countries that are better able to protect women's status relative to men's will be more likely to experience improvements in child nutritional status.

The female secondary enrollment rate improved for both sets of countries. The increase in the enrollment rate for the improving group is more than double that of the deteriorating group, although this difference is not statistically significant.

Differences in food availability were very important. Improving countries had an average increase in per capita dietary energy supply of 82 kilocalories, compared with an average decrease of 92 kilocalories in the other group. In the case of national income, improving countries had an average increase in per capita gross domestic product (GDP) of US\$175, compared with an average decrease of US\$82 in the other group, although the difference was not statistically significant. National income is a determinant of investment in health environments, education, improvements in women's status, and food supplies. Slow progress in both food availability and national income in this region is a result not only of rapid population growth, but also of conflict, the debt burden, and the HIV/AIDS epidemic (not measured in this analysis).

**TABLE 1.5 : Comparison of Sub-Saharan African countries with periods of increased versus decreased underweight rates over 1970–95**

	Group means		P-value for significance of difference in group means
	Countries with periods of decreased underweight prevalence (n = 18)	Countries with periods of increased underweight prevalence (n = 18)	
Change in underweight rate (percentage points)	5.5	6.0	.000*
Change in population with access to safe water (%)	7.4	8.4	.819
Change in female secondary school enrollment rate (%)	5.4	2.0	.122
Change in ratio of female life expectancy to male life expectancy (proxy for women's relative status)	.0025	0.119	.020*
Change in per capita dietary energy supply (kilocalories)	82	92	.008*
Change in per capita gross domestic product (US\$ purchasing price parity)	175	82	.141
Change in democracy (index from 1 to 7, 1 = least democratic)	0.5	0.8	.488

Source: Based on 36.

\*Statistically significant at least at 5% significance level.

BOX 1.3

## Overweight in Children

**I**n industrialized countries several studies report increasing prevalence of obesity in children. Some 23.7% of U.S. preschool children are overweight, and 7.4% are obese.<sup>37</sup> In developing countries, such studies are scarce. Research in Latin America has concluded that the levels of overweight and obesity in children under five in the region are lower than those in the United States, although prevalences in some countries are higher than expected statistically.<sup>38</sup> A clear pattern of change over time in overweight and obesity in Latin American children is not yet discernible.

Sub-regional, regional, and global estimates for the prevalence and number of overweight children under five ( $> +2$  SD of the NCHS/WHO reference median value) have recently been published by WHO.<sup>39</sup> These estimates incorporated new data from 160 nationally representative surveys. A weighted prevalence approach was used for sub-regions where the proportion of children covered by national surveys was greater than 70%. The median survey

year for countries that have nationally representative data does not allow for estimates beyond 1995. Summary results of this work are presented in Appendix 8.

An estimated 17.6 million children were overweight in the developing world in 1995. Northern and Southern Africa, Eastern Asia, Central America, and South America had prevalences higher than expected, while Western Africa and South Central and South-East Asia did not. A lack of data prevented estimation of prevalences for other sub-regions. Overall the prevalence of overweight in preschool children in developing countries is low (3.3%). Two regions have both overweight and stunting among their children. Northern Africa has a prevalence of overweight of 8.1%, while 20.2% of children are stunted. Central America has a prevalence of overweight of 3.5%, while stunting affects 24.0%. Countries in these regions are undergoing a rapid nutrition transition, including adoption of western diets that are high in saturated fats, sugar, and refined foods.<sup>30</sup> ■

In sum, this study reveals that the reasons why child undernutrition in many Sub-Saharan African countries has increased over the last 25 years and why the region as a whole has progressed very little are associated with declines in women's relative status, slow progress in improving women's educational attainment, and low per capita food availability and income.

### 1.3 The Growth of School-Age Children

The physical growth of schoolchildren aged six to nine years of age is the result of both environmental

and genetic factors and the interaction between these factors.<sup>42</sup> In poor populations the main factors affecting the physical growth of school-age children are environmental factors experienced before puberty.<sup>43</sup> These include poor food consumption patterns, illness, lack of sanitation, and poor health and hygiene practices.

The potential for catch-up growth among stunted children is thought to be limited after age two, particularly when children remain in poor environments.<sup>44</sup> A recent study in the Philippines has shown that some catch-up between the ages of two and eight and a half years is feasible for children who were *not* born with low birthweight or severely

**TABLE 1.6 : Prevalence of stunting among first-grade schoolchildren in Latin America and the Caribbean**

Country	Year	Number of children	Prevalence by age group				Total
			6	7	8	9	
Costa Rica	1997	85,786	4.6	6.4	13.5	23.2	7.5
Belize	1996	22,426	15.8	15.7	14.7	15.4	15.4
Mexico	1993	2,589,577	13.1	19.6	32.7	40.3	18.4
Dominican Republic	1995	188,091	12.1	18.6	24.0	30.9	19.0
Nicaragua	1986	100,265	16.5	23.3	28.9	37.2	23.9
Panama	1994	59,921	17.0	24.0	41.0	51.0	23.9
El Salvador	1988	120,457	20.5	25.9	32.7	37.8	29.8
Ecuador	1992	251,651	n/a	n/a	n/a	n/a	35.2
Honduras	1997	234,111	17.0	28.0	43.0	51.0	40.6
Peru	1993	653,854	n/a	n/a	n/a	n/a	48.0
Guatemala	1986	205,959	35.0	43.6	56.5	67.2	50.6

Sources: 49, 50, 52–60.

Note: n/a = not available.

stunted in infancy.<sup>45</sup> However, stunting at age two years, regardless of whether catch-up was achieved or not, is significantly associated with later deficits in cognitive ability, further emphasizing the need to prevent early stunting.<sup>46</sup> This is further discussed in section 4.1.

School feeding, both breakfast and lunch programmes, has been shown to improve school performance in both developing and industrialized countries.<sup>47</sup> Simply alleviating hunger helps children to perform better. Children who are hungry have more difficulty concentrating and performing complex tasks, even if they are otherwise well nourished. Studies in Jamaica have shown that children who were wasted, stunted, or previously undernourished benefited most from the programmes.<sup>48</sup>

Data on the growth of school-age children that are generated in a consistent manner across countries and over time are difficult to find. The best data sets derive from height censuses beginning in 1979 on children entering primary school (first grade) in 11 countries of Latin America and the Caribbean.<sup>49,50</sup> Height census data of schoolchildren have been used for planning, evaluation, and advocacy in Central America for some time.<sup>51</sup> This information has allowed governments and other organizations and institutions to detect growth retardation, to screen high-risk groups, and to target social interventions for nutrition security and human development.<sup>f</sup>

Stunting is common in schoolchildren in Latin America and the Caribbean (Table 1.6). In four of the countries in this review, more than one-third of children in school are stunted. In Guatemala and Peru prevalences are 50.6% and 48% respectively. Guatemala, Honduras, and Peru show a prevalence of stunting 20 times higher than expected in well-nourished populations. Children living in the northern areas of Central America have particularly high prevalences. These prevalences are similar to those found in other regions by the Partnership for Child Development in a five-country<sup>g</sup> analysis of stunting in schoolchildren.<sup>61</sup>

Primary school begins at age seven throughout Central America. In all countries except Belize, stunting is more prevalent among children who enter school at an older age. In Costa Rica stunting is up to five times higher in nine-year-olds than in six-year-olds. In Honduras, Mexico, and Panama older school entrants have three times more stunting than six-year-olds. Stunting is particularly widespread in Guatemalan nine-year-olds (67.2%).

Trends in stunting of schoolchildren are illustrated in Figures 1.3 and 1.4 for Costa Rica and Honduras. In Costa Rica, stunting dropped from 20.4% to 7.5% over the period 1979 to 1997, indicating a sustained improvement in the quality of life, including better basic health care and other services. This period saw the implementation of a strong food and nutrition security policy, which was effective in

<sup>f</sup> The data presented in this section are from 49, 50, 52–60.

<sup>g</sup> The five countries are Ghana, India, Indonesia, Tanzania, and Viet Nam.

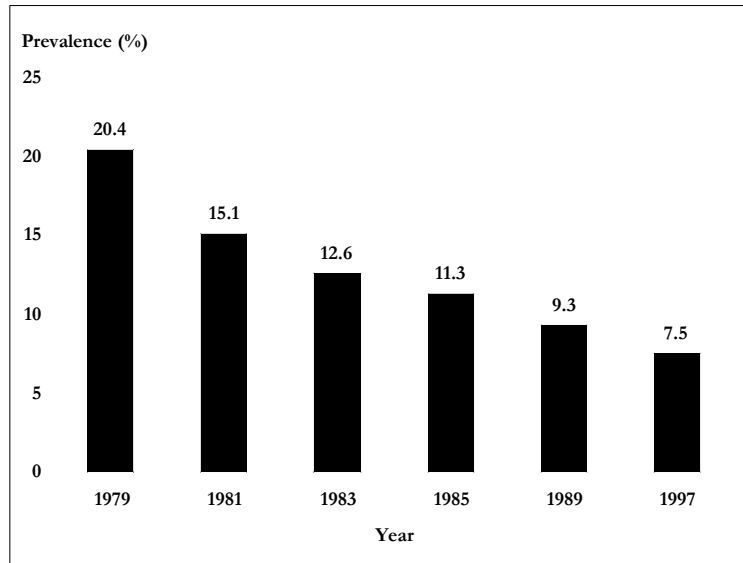
targetting the most socially and economically disadvantaged. In Honduras, on the other hand, the overall increase in stunting was probably related to the economic and sociopolitical crises this country faced during this period.

A higher proportion of boys than girls are stunted in all countries (Figure 1.5). This difference may be due to behavioural patterns associated with gender in Latin America and the Caribbean. In most of the countries, boys aged six to nine in general spend more time outside the home than girls do. Proximity to the household may allow girls better physical access to available food.

Table 1.7 shows prevalences of stunting broken into rural and urban categories for five countries. In all five countries schoolchildren living in rural areas are more stunted than children living in cities, by a wide margin. In Belize, stunting is more than three times more prevalent in rural areas than in urban areas. In Peru, stunting is almost twice as common in rural areas as in cities. This almost certainly reflects differential access to livelihoods and services.

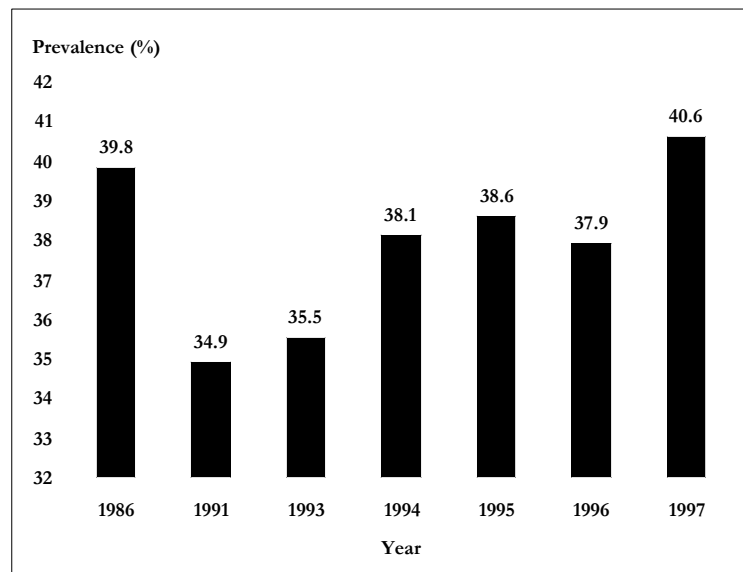
A paucity of data from other regions of the developing world has prevented an analysis of undernutrition in school-age children elsewhere. There are enormous educational and economic gains to be achieved from improving the nutrition and health of school-age children. There are also highly cost-effective means to achieve these aims, including mass application of antihelminthics, delivery of micronutrients (particularly iron and iodine), and treatment of injuries and routine health problems.

**FIGURE 1.3 : Prevalence of stunting among first-grade schoolchildren in Costa Rica, 1979-97**



Source: 50.

**FIGURE 1.4 : Prevalence of stunting among first-grade schoolchildren in Honduras, 1986-97**

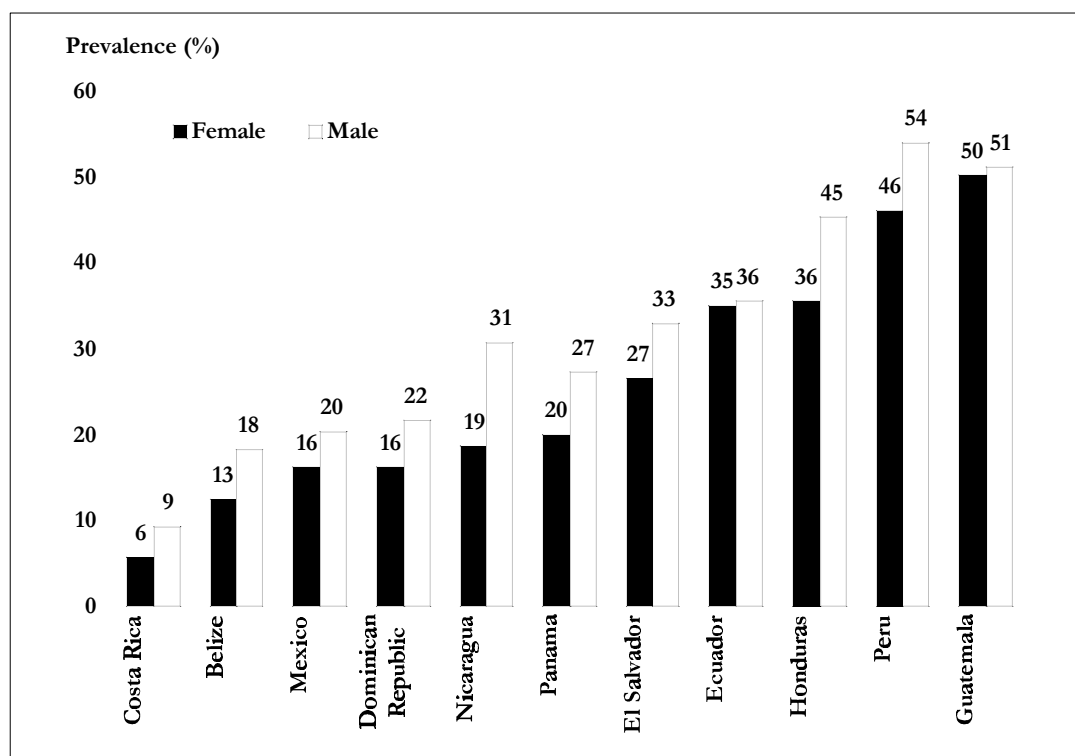


Source: 50.

## 1.4 Adolescent Nutrition

Adolescence is a transition phase when children become adults. During adolescence hormonal changes accelerate growth in height. Growth is faster than at any other time in the individual's postnatal life except the first year.<sup>62</sup>

**FIGURE 1.5 : Prevalence of stunting among first-grade schoolchildren in Latin America and the Caribbean, various years from 1986 to 1997**



Sources: 49, 50, 52, 60.

**TABLE 1.7 : Prevalence of stunting among first-grade schoolchildren in Latin America and the Caribbean by area of residence**

Country	Year of the last height census	Number of children	Prevalence by area (%)		
			Rural	Urban	Total
Belize	1996	22,426	22.5	6.9	15.4
Dominican Republic	1995	188,091	23.1	13.8	19.0
Nicaragua	1986	100,265	30.1	20.1	23.9
Honduras	1997	234,111	47.6	28.2	40.6
Peru	1993	653,854	67.0	35.0	48.0

Sources: 49, 50, 53, 54, 60.

Research has shown that better-nourished girls have higher premenarcheal growth velocities and reach menarche earlier than undernourished girls, who grow more slowly but for longer, as menarche is delayed.<sup>63</sup> Ultimately, these two factors tend to balance out, and total height achieved *during* adolescence may be similar for well-nourished and undernourished adolescents.<sup>64,65</sup> The adult height finally attained, however, may still differ as a result of pre-existing childhood stunting.

Because underweight adolescent girls are growing for longer, they may not finish growing before their first pregnancy. In India, for example, up to 67% of girls were classified as at obstetric risk (by weight and height criteria) in their 15<sup>th</sup> year compared with about 20% in their 19<sup>th</sup> year.<sup>66</sup> The mean age of first conception was 15.3 years in six large north Indian states.<sup>67</sup> In general, at least 25% of adolescent girls in the developing world have had their first child by age 19 and a great many more shortly thereafter.<sup>68</sup>

Adolescents who are still growing are likely to give birth to smaller infants than mature women of the same nutritional status<sup>2</sup> because of the competition for nutrients between the growing adolescent and the growing foetus<sup>69</sup> and poorer placental function.<sup>70</sup> Calcium status is a particular concern, as the bones of adolescents still require calcium for growth at a time when foetal needs for bone growth are also high.

Adolescent pregnancies also confer a higher risk of maternal and infant mortality and preterm delivery. Maternal mortality ratios for 15- to 19-year-olds in Bangladesh are twice as high as those for 20- to 24-year-olds.<sup>71</sup> These grave risks are further heightened by the fact that pregnant adolescent girls are less likely to use antenatal and obstetric services.

Adolescent growth varies significantly worldwide with many of the differences observed according to chronological age attributable to variation in timing of the growth spurt.<sup>65</sup> There is a dearth of detailed methodological work on the specific cut-offs, predictive values, and attributable risks of adolescent anthropometric indices.<sup>2</sup> More applied research is urgently required in these areas.

Data on adolescent nutritional status are also scarce. The most complete set of studies to date on adolescent nutritional status was carried out by the International Center for Research on Women (ICRW), which compared adolescent stunting rates as part of a multicountry study.<sup>72</sup> Stunting was recorded in 9 of the 11 studies (with prevalences ranging between 27 and 65%). The stunting process occurred in earlier childhood, for these children were stunted as they came into adolescence. Height-for-age did not improve across the eight years of adolescence.

Can undernourished children catch up on incomplete childhood growth during adolescence? There is little evidence to suggest that the growth retardation suffered in early childhood can be significantly compensated for in adolescence. Several types of studies have addressed this question. Some measure the effects of adoption (sudden environmental improvement), and some track changes over time in longitudinal studies.<sup>44</sup> These studies show that some catch-up growth may be possible. Very little work has been completed to determine whether nutritional and health interventions targeted to adolescents will bring about significant improvements. Stunted children are thus more likely than non-stunted children to become stunted adults as long as they continue to reside in the same environment that gave rise to the stunting.

Moreover, even if adolescent catch-up growth could be brought about by an intervention and stunting thus reduced, this would not necessarily rectify all of the problems for which stunting is merely a marker. For example, while a reduction in stunting would probably reduce obstetric risk due to small maternal size, it would not necessarily reverse the effects of early childhood stunting on cognitive function.<sup>46</sup> Both stunting and its functional correlates could, however, be addressed if the environment in which the young child grows is improved within the first two years of life.<sup>44</sup>

The INCAP follow-up study in Guatemala found that nearly 67% of severely stunted and 34% of moderately stunted three-year-old girls later became stunted adult women.<sup>73</sup> In addition, the prevalence of low birthweight was nearly twice as high in infants of women who suffered severe stunting at three years of age compared with those who were not stunted at the same age. Women with greater growth retardation during childhood also had smaller body frames and were thus at greater risk of obstructed labour. In another study in India, early childhood stunting among young girls was found, a generation later, to be significantly related to the birthweights and infant mortality risk of their children.<sup>74</sup>

Examining national anthropometric data in the *Second Report*, the ACC/SCN found a strong correlation between prevalence of underweight among preschool children in the 1970s and the prevalence of underweight in adult women in the 1980s.<sup>75</sup> Furthermore, strong associations existed between prevalence of underweight in adult women and low birthweight prevalence, and between low birthweight (1988) and preschool child underweight (1990) prevalence. These correlations are again broadly indicative of the tendency for smallness to be transmitted from one generation to another.

## 1.5 Adult Malnutrition

The economic livelihood of populations depends to a large extent on the health and nutrition of adults. In adults, the main cause of a reduction in body weight is a decrease in food intake, often in combination with disease, but when energy intake exceeds energy expenditure, the excess is stored in fat mass. Both underweight and overweight constitute adult malnutrition: once these conditions reach certain levels, the manifestations of adult malnutrition become apparent.



In adults, BMI or body mass index (calculated by dividing weight in kilograms by the square of height in meters) is used to define underweight or overweight. The WHO Expert Committee on Physical Growth has suggested the following classifications: mild underweight (BMI = 17.00–18.49 kg/m<sup>2</sup>), moderate underweight (BMI = 16.00–16.99 kg/m<sup>2</sup>), and severe underweight (BMI < 16.00 kg/m<sup>2</sup>).<sup>2</sup> These three groups are considered to be chronically energy deficient (CED). For overweight, the categories are as follows: Grade 1 (BMI = 25.00–29.99 kg/m<sup>2</sup>), Grade 2 (BMI = 30.00–39.99 kg/m<sup>2</sup>), and Grade 3 (BMI > 40.00 kg/m<sup>2</sup>).

There is only a limited literature on assessing nutritional status in adults and on diagnosing and treating malnourished adults. However, important health effects have been shown for those with BMI values below 18.5 kg/m<sup>2</sup> and for those above 25 kg/m<sup>2</sup>. Adults with low body weight allocate fewer days to heavy labour and are more likely to fail to appear for work owing to illness or exhaustion.<sup>76</sup> There seems to be a continuous gradient in work capacity and productivity that is linked to body weight. In developing countries there is some evidence that individuals with a BMI below 18.5 kg/m<sup>2</sup> show a progressive increase in mortality rates as well as increased risk of illness. A recent study among Nigerian men and women has shown that mortality rates among CED individuals who are mildly, moderately, and severely underweight are 40%, 140%, and 150% greater respectively than rates among non-CED individuals.<sup>2,77</sup>

Mid-upper-arm circumference (MUAC) has recently emerged in the literature as a potential screening tool for poor nutritional status in adults. MUAC has been analyzed in adults, and cut-offs have been calculated equivalent to BMI cut-offs for chronic energy deficiency using a range of data sets from developing countries.<sup>78</sup>

At the other end of the spectrum, overweight is associated with an increased prevalence of cardiovascular risk factors such as hypertension, unfavourable blood lipid concentrations, and diabetes mellitus.<sup>79</sup> It is also a major risk factor for the development of gallstones and is related to osteoarthritis in several joints. Overweight and the risk of endometrial cancer increase in direct proportion.<sup>80</sup> Mortality for both men and women is raised among individuals with a high BMI.<sup>81</sup>

A series of studies provides a basis for understanding the dynamic shifts in body composition that have occurred among adults in recent decades. There is now ample documentation that in Latin America, North Africa and the Middle East, and South-East Asia, more overweight than underweight exists among adults.<sup>82,83</sup>

The CED:obesity ratio, which reflects the ratio of undernutrition to overnutrition in a population, has shifted dramatically in the past several decades in many countries.<sup>82</sup> Research from Latin America has shown that the burden of obesity is becoming greater among the poor than among the higher-income groups.<sup>84</sup>

Further studies have used available national surveys from 1982 to 1996 from Latin American countries to estimate the prevalence of overweight in women 15 to 49 years old, as well as exploring recent trends.<sup>38</sup> A high level of overweight (a prevalence of 34–49%, excluding Haiti) was found in eight Latin American countries. Trends in obesity for Brazil, the Dominican Republic, and Peru also showed an increase. As for age distribution, studies in Brazil and elsewhere show that obesity is higher among 40- to 50-year-olds than among younger adults. However, obesity rates then begin to decrease with advancing years in most populations.

For this report we have brought together the data for nonpregnant women 20 to 49 years old, from the latest available Demographic and Health Surveys<sup>85</sup> and three national nutrition surveys.<sup>38</sup> Similar national survey data are not available for men. Data from 16 countries in Africa, 10 countries in Latin America and the Caribbean, 3 countries in Asia, and 1 country in North America are presented (Table 1.8).

Underweight is common among women in developing countries. Judging from survey results from South Central Asia, underweight is widespread among women in this sub-region. Some 51.3% of women in Bangladesh are underweight, about half of whom are moderately or severely underweight, with a BMI below 16.99 kg/m<sup>2</sup>. In six countries surveyed in Africa mild underweight affects more than 10% of women, and in two countries (Chad and Madagascar) prevalences are greater than 15%. In five countries surveyed in Africa moderate and severe underweight affects more than 3% of women. Except for Haiti, underweight among women in Latin America is less common. For most countries surveyed in this region, prevalences of mild underweight are well below 10%, and moderate combined with severe underweight affects less than 3% of women. Overweight (Grade 1) is seen in about one-third of women in Peru (36.6%), Bolivia (36.1%), and Colombia (31.6%) and affects at least one in four women in all countries surveyed, except for Haiti. Overweight prevalence rates exceed 15% in two African countries, Comoros and Namibia. Nearly one-third of Egyptian women have Grade 1 overweight.

**TABLE 1.8 : Prevalence of underweight and overweight of women 20–49 years old by country**

Region/country/ survey year	Sample size	Average age (years)	Underweight (BMI)			Overweight (BMI)		
			Severe (%)	Moderate (%)	Mild (%)	Grade 1 (%)	Grade 2 (%)	Grade 3 (%)
Africa								
Benin 1996	2,414	29.44	1.2	2.1	10.8	7.3	2.0	1.2
Burkina Faso 1992	5,243	29.92	0.6	2.3	10.6	5.9	0.7	0.8
Central Af Rep 1995	2,112	28.45	1.2	2.1	12.0	6.0	1.3	0.8
Chad 1997	5,793	28.85	2.1	4.2	13.5	4.5	0.8	1.9
Comoros 1996	924	29.97	0.4	1.2	7.0	16.8	4.7	0.3
Côte d Ivoire 1994	3,077	28.79	0.4	1.5	6.0	11.7	3.2	0.6
Egypt 1996	9,503	29.48	0.1	0.4	1.3	31.1	17.3	2.1
Ghana 1993	1,853	29.52	0.8	1.8	9.0	10.0	3.3	0.1
Kenya 1998	2,816	28.31	0.7	1.4	8.6	10.8	2.2	2.8
Madagascar 1997	2,880	28.89	1.7	3.1	15.1	3.5	0.5	0.1
Malawi 1992	3,527	30.20	0.4	1.3	6.3	8.4	0.8	0.2
Namibia 1992	3,096	30.25	1.1	1.8	9.9	14.7	6.5	1.2
Niger 1998	3,680	29.00	0.9	2.7	15.8	6.5	1.7	0.1
Tanzania 1996	5,573	29.64	0.8	1.5	6.6	10.8	2.4	1.1
Uganda 1995	4,471	28.32	0.5	1.3	7.5	7.6	1.2	1.2
Zambia 1996	5,666	28.87	0.5	0.9	7.1	11.4	2.2	0.5
Latin America								
Bolivia 1998	5,698	30.26	0.0	0.2	0.5	36.1	11.0	0.6
Brazil 1996	3,713	28.93	0.3	1.2	5.1	25.6	9.4	0.5
Colombia 1995	4,101	28.88	0.1	0.5	2.9	31.6	9.1	0.5
Dominican R 1996	3,443	27.90	0.5	0.8	5.1	27.5	9.5	1.0
Guatemala 1995	7,156	29.54	0.3	0.5	2.5	26.7	7.0	0.4
Haiti 1994/95	1,782	30.86	2.0	3.6	13.0	9.1	2.7	0.0
Honduras 1996	837	30.70	1.1	1.0	6.5	24.1	7.7	0.6
Mexico 1987	2,793	32.56	1.0	1.5	5.1	28.2	12.2	0.7
Nicaragua 1998	6,337	28.74	0.2	0.3	3.0	28.4	10.4	1.2
Peru 1996	1,388	30.01	0.0	0.1	0.9	36.6	8.8	0.4
Asia								
Bangladesh 1996	4,743	27.31	9.5	13.5	28.3	2.2	0.4	1.6
Nepal 1996	3,026	28.06	2.9	5.4	19.1	1.7	0.1	0.0
Uzbekistan 1996	1,211	26.83	1.4	1.2	8.5	12.6	3.6	0.1
North America								
USA 1988 94	4,380	34.27	0.1	0.5	3.6	21.6	18.8	3.7

Source: 85.

Note: For severe underweight, BMI < 16.00 kg/m<sup>2</sup>; moderate, BMI = 16.00–16.99 kg/m<sup>2</sup>; mild, BMI = 17.00–18.49 kg/m<sup>2</sup>. For Grade 1 overweight, BMI = 25.00–29.99 kg/m<sup>2</sup>; Grade 2, BMI = 30.00–39.99 kg/m<sup>2</sup>; Grade 3, BMI > 40.00 kg/m<sup>2</sup>.

## 1.6 Nutrition of Older People in Developing Countries

Populations are ageing. The 20<sup>th</sup> century has seen an unprecedented transition from high birth and death rates to low fertility and mortality. In 1950 there were about 200 million people over 60 years; by 2025 there will be 1.2 billion, of whom nearly 70% will live in developing countries. The majority of poor older people in developing countries enter old age

after a lifetime of poverty and deprivation, poor access to health care, and a diet that is usually inadequate in quantity and quality. For most of these older people, retirement is not an option. Poverty, lack of pensions, deaths of younger adults from AIDS, and rural to urban migration of younger people are among the factors that compel older people to continue working. Adequate nutrition, healthy ageing, and the ability to function independently are thus essential components of a good quality of life.

In 1992, the London School of Hygiene and Tropical Medicine (LSHTM), in collaboration with HelpAge International, began a programme of research on the nutrition of older adults in developing countries. The objectives of the programme were to test simple anthropometric measures of nutritional status, assess functional ability, and examine the risk factors of nutritional vulnerability. Fieldwork was undertaken in three sites: the urban slums of Mumbai, India,<sup>86</sup> a Rwandan refugee camp in Tanzania<sup>87</sup> and rural communities in Lilongwe, Malawi.<sup>88</sup> Other larger-scale research efforts are under way in a number of countries with similar objectives (China, for example, has several longitudinal studies on this topic).

WHO states that conventional BMI cut-offs for defining CED may not be appropriate for older people above 70 years, because of age-related changes in body composition.<sup>2</sup> There are also practical problems with obtaining accurate BMI measurements in this group because of curvature of the spine. The LSHTM group found that a MUAC cut-off of 21.7 cm had a sensitivity of nearly 86% in relation to the BMI cut-off of 16 kg/m<sup>2</sup> and proposed it as an alternative to BMI as part of a screening tool in the acute phase of an emergency. Further studies are urgently needed in this area.

Table 1.9 shows the prevalence of undernutrition by sex in the three studies.<sup>86,89,90</sup> In all three studies, the prevalence of undernutrition increased with age among women. This was most marked in India, where it rose to nearly 60% among women over 70 years. The lower prevalence of undernutrition in the refugee population is probably because the study was conducted in the postemergency phase: the sample represented those who had successfully reached the camp and survived a year in exile.

Nutritional status was related to functional ability. The strongest relationship was with handgrip strength, a measure of the strength of the upper limb. Undernutrition was also found to be associated with higher risk of impairments in psychomotor

speed and coordination, mobility, and the ability to carry out activities of daily living independently, even after controlling for age, sex, and disease.

Sarcopenia, the gradual loss of muscle mass with age, appears widely prevalent and has been linked to ageing-related losses of strength, increased risks of morbidity, functional impairment, dependence, and mortality. One recent longitudinal study of 1,504 Chinese adults has shown that energy and protein intake can directly affect this condition.<sup>91</sup>

Research is urgently needed to assess the magnitude of the nutrition problem among older people, including micronutrient status, and to refine techniques for the anthropometric assessment of nutritional status. The appropriateness of conventional BMI cut-offs for older adults needs to be assessed. Nutrient requirements for older people are mostly extrapolated from younger adults in developed countries and assume the reduction in energy expenditure associated with retirement. These requirements may not be correct for poor older people in developing countries. There are also age-related changes that can lead to reduced or altered food intake: physiological changes in the sense of taste, poor appetite (often associated with loneliness, social isolation, depression, or medications), physical factors such as absent or ill-fitting dentures, limited ability to procure or prepare food because of musculoskeletal disorders or other disease conditions, and chronic disease.

There is almost no experience of nutrition interventions for older adults. We have little or no idea of what works, nor do we even know if their nutritional status can be improved or if such improvement would lead to better functional ability. Operational research in these areas is needed to fulfill the right of older adults to adequate nutrition.

## Summary

Global progress in reducing undernutrition through the life cycle is slow and patchy across regions. Prevalence rates, particularly of low birthweight, stunting, and underweight, remain high across most sub-regions, particularly in Eastern Africa and South Central Asia.

In South Central Asia, about one in five children born this year will be undernourished at birth – the most startling manifestation of the intergenerational transmission of undernutrition. Intrauterine growth retardation is a pivotal indicator of progress in breaking the intergenerational cycle of undernutrition, a prospective marker of a child's future

**TABLE 1.9 : Prevalence of undernutrition from three studies of older people**

	Men	Women
India (Mumbai slums)	35.0%	35.0%
Rwandan refugees	19.5%	13.1%
Malawi (rural Lilongwe)	36.1%	27.0%

Sources: 86, 89, 90.

Note: Undernutrition here indicates a BMI of < 18.5 kg/m<sup>2</sup>.

nutrition and health status as well as a retrospective measure of the nutritional and health status of the mother. Given our increasing knowledge of the implications of being born undernourished for adulthood, it should also be considered a valuable summary indicator of human development.

Overall, more than a third of all children in the developing world remain constrained in their physical growth and cognitive development by undernutrition. The ambitious goal of halving childhood underweight prevalence by the year 2000, set at the 1990 World Summit for Children, will not be achieved by most countries. While the high rates of child undernutrition in South Asia are well known, these continue to drop, albeit not very rapidly. Most disturbing is the fact that two sub-regions – Eastern and Western Africa – are actually showing significant increases in prevalence percentages. On the positive side, two sub-regions – the Caribbean and South America – will manage to reach the World Summit goal.

Data on the nutritional status of individuals at different stages of the life cycle are slowly becoming available but remain limited. The emergent situation of co-existing undernutrition and overnutrition among adults is notable, as is the extreme paucity of data on older adults, a group that will continue to grow proportionately in developing-country populations. This chapter has described the nature, levels, causes, and consequences of malnutrition proxied by anthropometry as it persists through the life cycle. Basic prevalence data are still needed in many countries.

Although this chapter argues for a particular focus on *preventing* foetal and early childhood malnutrition, the life cycle dynamics of cause and consequence demand a holistic inclusive approach. Adequate nutrition is a human right for all people, and intervening at each point in the life cycle will accelerate and consolidate positive change. The next chapter provides an update on the global, regional, and sub-regional situation regarding micronutrient deficiencies and programmes for their prevention and control.

## 2 MICRONUTRIENT UPDATE

**A**s the life cycle turns, so the risk of micronutrient deficiencies changes. Causes and consequences of early childhood deficiencies have implications for later life and may be present as risk factors for future generations. Severe iron deficiency anaemia during pregnancy may even place a woman's life at risk during childbirth. Starting with the foetus, iodine deficiency disorders (IDD) may cause brain damage or stillbirth. Folate deficiency of the pregnant woman may result in neural tube defects during foetal development. Iron deficiency anaemia and vitamin A deficiency in the pregnant woman may also have significant implications for the newborn infant, born with low stores. Vitamin A deficiency (VAD) may increase morbidity and mortality risk and affect vision, while anaemia and iodine deficiency disorders may lead to cognitive deficits. Other nutrients are important at certain times in life, such as calcium and folate in adolescence.

The *Third Report* described the situation of several micronutrient deficiencies in the developing world. While the focus then was primarily on iron, vitamin A, and iodine deficiencies, brief descriptions of the situation with regard to folic acid, zinc, and calcium were also included. A comprehensive review of the programmes to prevent and control these deficiencies was also provided.<sup>1</sup> In this *Fourth Report*, we provide an update of progress in this area during 1998 and 1999, whether in improved knowledge of the nature, causes, or consequences of the problem or in the approaches adopted to deal with it.

We start by using the limited number of recent available surveys to present an update on the prevalence of anaemia as an indicator of iron deficiency and the magnitude of the population at risk of iodine deficiency. Using vitamin A as an example, we illustrate some of the difficulties in estimating the magnitude of the global problem for these three nutrients. While we recognize that other micronutrient deficiencies, such as zinc, are likely to be problems,

we offer no estimates of their magnitude or severity as data simply do not exist. There remains a great need for nationally representative data on the prevalence and trends in these deficiencies to inform and improve policy and programme decisions. For each micronutrient, an update is also provided on strategies for the prevention and control of the deficiency. The final section considers the potential of multiple micronutrient supplementation and fortification and the advances being made to realize it.

Data in this chapter refer to stable populations. The micronutrient status of internally displaced people and refugee populations—including the sporadic outbreaks of more uncommon deficiencies such as scurvy, beriberi, and pellagra—is described in Chapter 5.

### 2.1 Iron Deficiency Update

Iron is essential for the production of haemoglobin, which helps deliver oxygen from the lungs to body tissues, transport electrons in cells, and synthesize iron enzymes that are required to utilize oxygen for the production of cellular energy.<sup>2,3</sup> Iron balance is determined by the body's iron stores, iron absorption, and iron loss. At least two-thirds of body iron is functional iron, mostly haemoglobin within circulating red blood cells, with some as myoglobin in muscle cells and parts of iron-containing enzymes. Most of the remaining body iron is storage iron (existing as ferritin and haemosiderin), which serves as a deposit to be mobilized when needed.

The reduction of body iron has three main stages: (1) iron depletion, which refers to a decrease of iron stores, measured by a reduction in serum ferritin concentration; (2) iron deficient erythropoiesis, when storage iron is depleted and there is insufficient iron absorption to counteract normal body losses (at this time, haemoglobin synthesis starts to become impaired and haemoglobin concentrations fall); and (3) iron deficiency anaemia, the most severe degree of iron

deficiency, which ensues if the haemoglobin concentration falls below a statistically defined threshold lying at two standard deviations below the median of a healthy population of the same age, sex, and stage of pregnancy.<sup>4</sup> For every case of iron deficiency anaemia found in a population, there are thought to be at least two cases of iron deficiency.<sup>5</sup> A recent report has questioned the current criteria for diagnosis of anaemia and suggested that these be reviewed and revised to link them explicitly to functional outcomes of public health significance.<sup>6</sup>

Knowledge continues to grow of the very serious functional consequences of iron deficiency anaemia. A recent analysis of the economic consequences of iron deficiency has estimated the median value of productivity losses due to iron deficiency to be about US\$4 per capita, or 0.9% of GDP, for a range of developing countries.<sup>7</sup> The dominant effect is the loss associated with cognitive deficits in children. This estimate does not include the burden of maternal death associated with severe anaemia, nor the lowered effectiveness of funds spent on education.

## Comparing Prevalences and Numbers

Iron deficiency and its anaemia affect more than 3.5 billion people in the developing world.<sup>8</sup> While accurate prevalence estimates are difficult to obtain and periodically revised, all public health and nutrition experts agree that this is a huge problem.

To estimate iron deficiency at the global, regional, or national level, anaemia prevalences are used as a proxy indicator. This assumption – namely that iron deficiency is the main cause of anaemia – is likely to hold true in industrialized countries but is less certain in some regions of the developing world where other factors play an important role. These other factors include, for example, malaria and some other parasitic infections, current infectious disease, and other pathologies as well as other nutrient inadequacies that may limit haemoglobin formation. Any estimate of iron deficiency based on anaemia data can thus only be an approximation.

The level of haemoglobin concentration in the blood is used as an indicator to estimate the prevalence of anaemia. Other criteria have been recommended by the Centers for Disease Control and Prevention (CDC) for pregnant women, but these have not yet been adopted and applied on a broad basis. Table 2.1 presents the cut-off points recommended by UNICEF, UNU, and WHO.

When global anaemia prevalence is examined for each physiological group, using the WHO Global

**Table 2.1 : Cut-off points for blood haemoglobin concentration to define anaemia by age group**

Age group	g/L
6–59 months	110
5–11 years	115
12–14 years	120
Nonpregnant women	120
Pregnant women	110
Adult males	130

Source: 4.

Database on Anaemia, the most affected groups are pregnant women (48%) and 5- to 14-year-old children (46%). Preschool children (39%) are also a high-risk group. However, the preschool data should be interpreted cautiously as the prevalence estimates are based on a limited number of surveys, mostly carried out in North and Latin America. Small-scale studies in Africa and Asia have shown higher prevalences for this age group.

Predictably, the prevalence of anaemia in developing countries is three to four times higher than in industrialized countries. The most highly affected population groups in developing countries are pregnant women (56%), school-age children (53%), nonpregnant women (44%), and preschool children (42%). But another group demands attention as well: older adults, half of whom are anaemic (51%).

In industrialized countries, the most-affected groups are pregnant women (18%) and preschool children (17%), followed by nonpregnant women and older adults, both at 12%. The prevalence of anaemia is low for adult males in industrialized countries (5%), but no less than one-third of adult males are anaemic in developing countries (see Figure 2.1). Prevalence estimates are not disaggregated by severity, although such distinctions are increasingly being made in field programmes where the priority is usually to prevent severe anaemia and its high functional costs.

Figure 2.2 presents prevalences by WHO region. (A list of countries in each WHO region appears in Appendix 9.) With regard to preschool children, anaemia prevalence is the highest in Africa and Asia. In Africa the middle part of the continent from the west to the east is the most affected, with anaemia prevalences ranging from 42% to 53%. In Asia the most affected sub-region is South Central Asia. In the Americas the Caribbean is most affected, with a prevalence of 39%, while anaemia prevalences in South and Central America are similar to those observed in the remaining parts

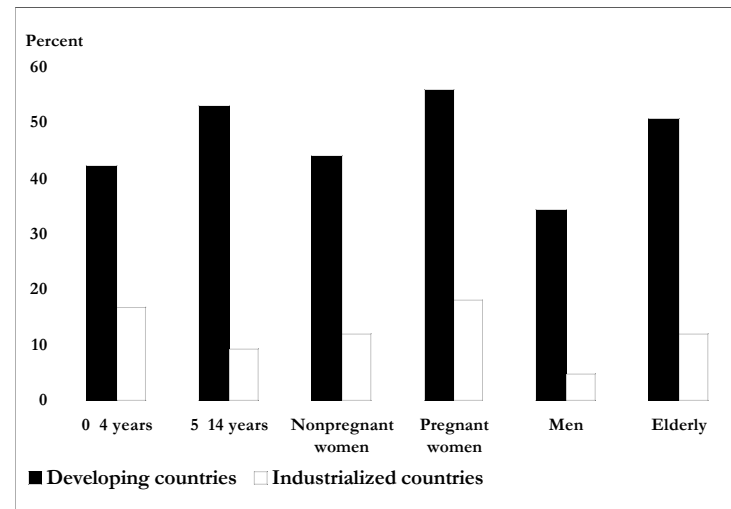
of Africa and Asia. Among industrialized countries, anaemia prevalences are lowest in Northern Europe (2%) and around 5% in Western Europe and North America.

The geographical pattern of anaemia in pregnant women follows that observed for preschool children, with the most affected regions being Africa and Asia (Figure 2.3). In Asia anaemia prevalences are as high as 75% in South Central Asia; in Africa they range from 47% in Eastern Africa to 56% in Western Africa. In the Americas the prevalence is highest in the Caribbean. In industrialized countries the prevalences range from 14% in Oceania (Australia and New Zealand) to 20% in Eastern Europe.

Finally, although the data for 5- to 14-year-olds are limited, some estimates can be made. The prevalence of anaemia is highest in South-East Asia (63%) and Africa (52%), followed by the Eastern Mediterranean (45%), the Americas (23%) and the Western Pacific (21%). In industrialized countries, regional prevalences range from 5% in North America to 22% in Europe, including high prevalences in Eastern Europe.

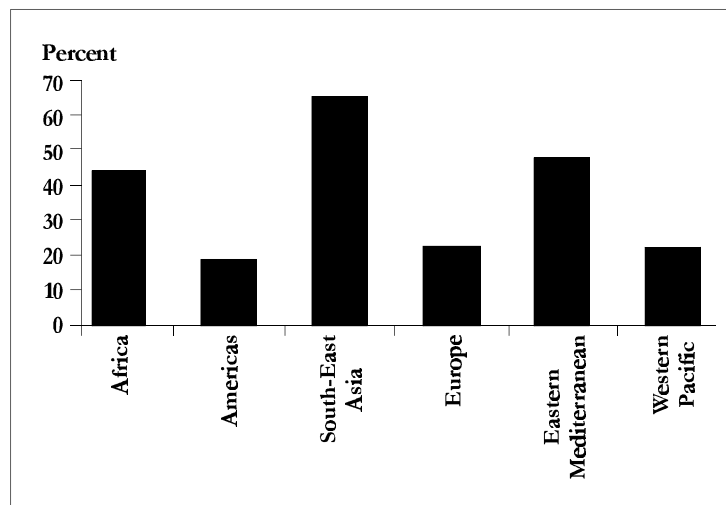
Data on adolescents are scarce. In a multicountry study on adolescent nutritional status carried out by the International Center for Research on Women (ICRW), anaemia was found to be the most widespread nutritional problem and highly prevalent in four of the six country studies in which it was assessed. Prevalences ranged from 32 to 55%; there was no significant gender difference.<sup>10</sup> Before the ICRW study, little research had been done on anaemia during adolescence. While girls lose more iron

**FIGURE 2.1 : Prevalence of anaemia by age group in industrialized and developing countries, 1998**



Source: 9.

**FIGURE 2.2 : Prevalence of anaemia in children 0-5 years old by WHO region, 1998**

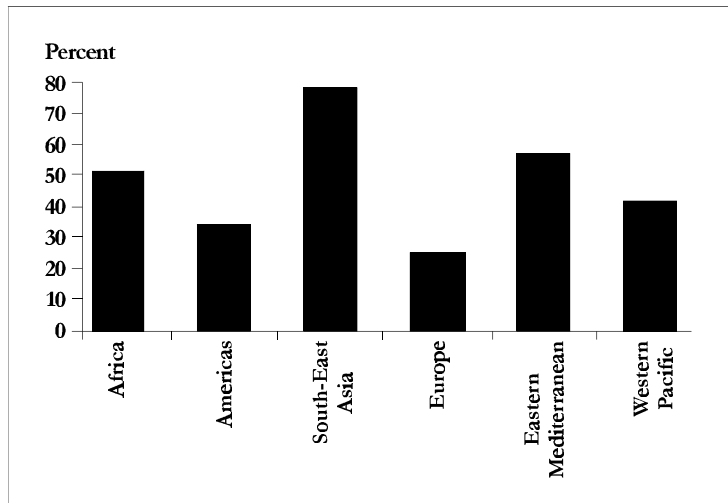


Source: 9.

through menses, boys may need more per kilogram weight gained, as relatively more muscle is built during male than female adolescent growth.

With regard to older adults, some data are available from the LSHTM study described in section 1.6. In India, the prevalence of anaemia among people over age 60 was found to be high, using WHO criteria: 38% among men (< 130g/L) and 52% among women (< 120g/L). Among women over 70 years, the prevalence rose to 70%. In both men and women, the prevalence of anaemia was highest among those with severe undernutrition (BMI < 16 kg/m<sup>2</sup>).

**FIGURE 2.3 : Prevalence of anaemia in pregnant women by WHO region, 1998**



Source: 9.

These are only rough estimates of the global prevalence of anaemia, which need to be refined. Few countries have reported data on anaemia prevalences at the national or sub-national level, so some sub-regions, such as Oceania and Eastern Europe, are poorly covered by the database. Trends could not be assessed anywhere, owing to the lack of repeated, comparable national surveys of anaemia. Moreover, different methods for sampling, assessment, and classification often render data difficult to use. One thing is clear, however: anaemia remains a major problem with serious consequences.

## Prevention and Control

A recent joint technical workshop concluded that interventions to control iron deficiency are available, affordable, and sustainable.<sup>8</sup> Advances have been made in iron fortification of food staples or condiments and in fortification of complementary foods. A recent review has concluded that iron fortification does not significantly increase the prevalence of iron overload in susceptible individuals, nor the rate at which it develops. These concerns should not constrain the development of iron fortification programmes.<sup>11</sup> The use of iron/folate supplements to prevent iron deficiency in malaria-endemic regions has also been endorsed by expert groups.

Nonetheless, in contrast to vitamin A and iodine deficiency control, there remains a significant gap between the efficacy (potential effect) and the effectiveness (actual effect under expected conditions) of programmes aimed at controlling iron deficiency

anaemia among highly vulnerable sub-groups such as pregnant women and older infants. Oral iron supplementation programmes are blighted by problems ranging from an inadequate supply of supplements (itself often related to the low priority attached to control of iron deficiency) to poor compliance with their consumption. The UNU/UNICEF/WHO/MI technical consultation recommended better monitoring, evaluation, and research to improve effectiveness.

An authoritative meta-analysis of the efficacy of intermittent iron supplementation was completed in 1999.<sup>6</sup> The major findings were that (1) both daily and weekly iron supplementation are efficacious, but weekly supplementation is likely to be less effective than daily administration, except in situations where weekly but not daily supervision is feasible; (2) weekly supplementation may be particularly disadvantageous during pregnancy and in situations where the baseline prevalence of anaemia is high; (3) unless ways are found to greatly improve compliance, neither daily nor weekly supplementation is likely to be an effective approach to preventing and controlling anaemia in developing countries, and (4) regardless of the degree of supervision that can be arranged, weekly iron administration instead of daily is *not* recommended for pregnancy.

This analysis concludes with a call for applied research to develop other strategies for effectively improving utilizable iron intakes (by altered food usage or food fortification where this is feasible) or for greatly improving compliance in daily or weekly direct supplementation programmes.

One other approach gaining momentum is self-fortification through plant breeding, which holds great promise for making a significant, low-cost, and sustainable contribution to reducing micronutrient deficiencies. In this approach, plant breeders seek to take advantage of existing consumption behaviours by developing staple food crops that, in some sense, fortify themselves by loading high amounts of minerals and vitamins into their seeds. One promising variety being tested at the International Rice Research Institute



(IRRI) has double the iron (after milling) of standard IRRI releases and is also early maturing, high yielding, and disease resistant. Bioavailability tests using human subjects are planned for 2000. Pending the results of these and other agronomic tests, the new variety may be ready for release to farmers in the Philippines in a few years.<sup>12</sup>

The development of strategies to control iron deficiency is further hampered by uncertainties concerning its etiology in different situations particularly in Africa where the non-iron deficiency causes of anaemia may be significant. Working criteria to distinguish the different types of anaemia are needed in order to better define the target groups as well as the most appropriate action. A recently developed tool the life cycle anaemia risk matrix may help in organizing etiological assessments, with a view to better determining and prioritizing appropriate control strategies.<sup>4</sup>

Our understanding of the consequences of iron deficiency has advanced significantly, as has our knowledge of *what* to do, but our understanding of *how* to implement appropriate interventions effectively on a large scale is still limited. Research in this area remains an absolute priority. Allied to this, more effective advocacy and communication on the national importance of iron deficiency prevention and control are urgently required.

## 2.2 Iodine Deficiency Disorders Update

The disorders induced by dietary iodine deficiency (IDD) constitute a major global nutrition concern. The effect of iodine deficiency on the thyroid gland has been known for many decades. Knowledge of the impact of iodine deficiency *on mental development* has played an important role in mobilizing political leaders, public health officials, nutritionists, and private industry worldwide to launch effective national programmes. Progress towards elimination of IDD through universal salt iodization appears to be one of the most significant successes in the field of non-communicable disease.

Iodine is required for the synthesis of thyroid hormones, which are involved in regulating metabolic activities of all cells throughout the life cycle. In addition, it plays a key role in cell replication. This is particularly relevant for the brain since neural cells multiply mainly *in utero* and during the first two years of life. IDD comprises all the effects of iodine deficiency. In the foetus

these effects lead to increased rates of abortion, stillbirths, congenital anomalies, cretinism, psychomotor defects, and neonatal mortality. In the child and adolescent, the effects manifest as goitre, hypothyroidism, impaired mental function, retarded mental and physical development, and diminished school performance. In adults, goitre and its complications, hypothyroidism, and impaired mental function persist.<sup>13</sup>

Median urinary iodine and the prevalence of goitre are the most important indicators for assessing IDD and for describing the severity of IDD as a public health problem. School-age children are the most appropriate target group for IDD surveillance.

Urinary iodine is a marker of very recent dietary iodine intake. The normal population median value of urinary iodine is 100–200 µg/L. Values of 50–99 µg/L suggest mild iodine deficiency, while values of 20–49 and below 20 µg/L suggest moderate and severe iodine deficiency, respectively.<sup>14</sup> The benchmark for monitoring progress towards elimination of IDD as a public health problem is 50% of the target group with urinary iodine below 100 µg/L and less than 20% with levels below 50 µg/L.

A goitre is an enlarged thyroid. Thyroid size can be determined clinically by inspection and palpation. Goitre is graded according to size: grade 0 is not palpable or visible; grade 1 is a mass in the neck, consistent with an enlarged thyroid, that is not visible when the neck is in the normal position; and grade 2 is a swelling in the neck that is visible when the neck is in a normal position. Palpation becomes less reliable when average goitre size decreases in a population. Ultra-sonography then provides a more precise and objective method. Ultra-sonography is increasingly used to assess population iodine nutrition, and normative values for thyroid volume measured by ultra-sonography in iodine-replete schoolchildren are needed. The *Third Report* noted that normative values based on pooled samples of schoolchildren living in Europe had been adopted and were applicable worldwide. This has recently been questioned in light of evidence that some populations of school-age children with adequate median urinary iodine have thyroid volumes much lower than the normative values adopted by WHO. The need for regional scales remains a possibility.<sup>15</sup>

Finally, elevated serum thyroid stimulating hormone (TSH) in the neonate indicates insufficient supply of thyroid hormone to the developing brain. This is the only indicator that allows prediction of possible impairment of mental development at a population-wide level.

## Comparing Prevalences and Numbers

In a joint effort WHO, UNICEF, and ICCIDD recently presented data on the status of IDD at the regional and global levels.<sup>16</sup> Of the 191 countries assessed, 130 are affected by IDD (Table 2.2). Of the remaining 61 countries, IDD has been eliminated, or is known not to be present in 20. Data are insufficient for 41 countries, more than half of which are small island states, where IDD is unlikely to be severe. Almost every country in Africa has IDD.

When these figures are transformed into numbers affected by goitre or at risk of IDD (that is, living in a geographical region where the total goitre rate in school-age children is > 5%), it is clear that the scale of the global problem is immense (Table 2.3). Globally about 740 million people are affected by goitre, and more than 2 billion (or over 38% of

the population living in 130 countries) are estimated to be at risk of IDD. Many countries including China and India have come to regard their entire population as at-risk of IDD.

## Prevention and Control

Despite the magnitude of the IDD problem, great progress has been made in recent years towards its elimination. The main thrust has been establishing and sustaining national salt iodization schemes. Effective partnerships have been forged between relevant UN agencies, national and international NGOs, and the salt industry. Globally, 68% of households in countries with IDD now consume iodized salt (Table 2.4). Iodization rates are highest in the Americas at 90%. Africa has achieved a level of 63%.

**TABLE 2.2 : Number of countries affected by IDD, 1999**

Region	Total number of countries in region	Countries where IDD is a public health problem	Countries where IDD has been eliminated <sup>a</sup> or is nonexistent	Countries with insufficient data <sup>b</sup>
Africa	46	44	1	1
Americas	35	19	3	13
South-East Asia (includes India)	10	9	0	1
Eastern Mediterranean	22	17	1	4
Europe	51	32	13	6
Western Pacific (includes China)	27	9	2	16
Total	191	130	20	41

Source: 16.

<sup>a</sup> IDD elimination is defined as a total goitre rate (TGR) of < 5% in school-age children.

<sup>b</sup> Data are insufficient to categorize countries.

**TABLE 2.3 : Current magnitude of IDD, 1999**

Region	Population <sup>a</sup> (million)	Population affected by goitre		At-risk population	
		Million	% of regional population	Million	% of regional population
Africa	612	124	20	295	48
Americas	788	39	5	196	25
South-East Asia	1,477	172	12	599	41
Eastern Mediterranean	473	152	32	348	74
Europe	869	130	15	275	32
Western Pacific	1,639	124	8	513	31
Total	5,857	740	13	2,225	38

Source: 16.

<sup>a</sup> Based on UN Population Division 1997 estimates.

**TABLE 2.4 : Current status of household consumption of iodized salt, 1999**

Region	Number of countries with IDD	Number of countries with a given % of households consuming iodized salt						Overall % of households consuming iodized salt
		No data	< 10%	10-50%	51-90%	> 90%		
Africa	44	8	6	8	19	3	63	
Americas	19	0	0	3	6	10	90	
South-East Asia	9	0	1	2	5	1	70	
Eastern Mediterranean	17	5	1	2	6	3	66	
Europe	32	10	4	12	4	2	27	
Western Pacific	9	0	1	4	3	1	76	
Total	130	23	13	31	43	20	68	

Source: 16.

Note: These figures reflect household survey data where this is available; otherwise production-level data are used as a proxy. To estimate the overall iodization rate, total population of each country is multiplied by the per cent of households consuming iodized salt. Numbers are then totaled for each region and divided by the total regional population.

Several national programmes in which the salt industry has exercised leadership have shown spectacular success and made enormous strides towards IDD elimination. In China, for example, most provinces now have over 90% coverage with iodized salt. The national median urinary iodine is 314 µg/L, and all provinces except Tibet have a median concentration greater than 100 µg/L. Adjusted for population, the national total goitre rate is estimated as 10.9% by palpation and 9.6% by ultra-sonography, compared with just over 20% in 1995. The keys to China's success are effectively iodized salt, enforcement of regulations, strong commitment by government at all levels, an intensive educational programme, and monitoring of salt quality and biological impact.<sup>17</sup> China's success clearly demonstrates how rapid increases in rates of effective salt iodization can increase urinary iodine levels and decrease goitre prevalence.

It takes longer, however, to correct the prevalence of goitre than to correct urinary iodine after the implementation of universal salt iodization, according to a recent study of seven African countries.<sup>18</sup> Three countries in the sample (DR Congo, Cameroon, and Nigeria) had a particularly long history of severe IDD. The goitrogenic action of iodine deficiency had been aggravated by the long-term consumption of poorly detoxified cyanide-rich cassava. The national implementation of salt iodization ranged from one year (Tanzania and Zimbabwe) to about five years (Kenya). Two to three areas were visited in each country, and goitre prevalence and median urinary iodine levels were determined in school-age children. Median urinary iodine was above 100 µg/L at all sites visited. This is a major

public health success, given the remote location of the sites and their long histories of IDD. The prevalence of goitre had decreased in all sites investigated (compared with the period before salt iodization), but goitre rates were still not below the 5% mark, designated as a criterion for the elimination of IDD.

## 2.3 Vitamin A Deficiency Update

Vitamin A is an essential micronutrient for the normal functioning of the visual system, growth and development, maintenance of epithelial cellular integrity, immune function, and reproduction.

Clinical deficiency of vitamin A is defined by the presence of night blindness, Bitot's spots, corneal xerosis and/or ulcerations, and xerophthalmia-related corneal scars. Subclinical deficiency of vitamin A for preschool-age children is defined as the prevalence of serum retinol values < 0.70 µmol/L minus the prevalence of clinical vitamin A deficiency. Among well-nourished, healthy populations of preschool-age children, and even those still living in poverty but whose vitamin A status is adequate, fewer than 5% have values less than 0.70 µmol/L.<sup>19</sup>

Vitamin A deficiency occurs when body stores are depleted to the extent that physiological functions are impaired. At first, the integrity of epithelial barriers and the immune system become compromised, followed by impairment of the visual system. Consequently, there is increased severity of some infections and an increased risk of death, especially among children. Improving the vitamin A status of young children reduces mortality rates by about

23%, in populations where there is vitamin A deficiency.<sup>20</sup> More severe vitamin A depletion leads to night blindness, which can evolve to irreversible partial or total blindness if the depletion continues.<sup>19</sup>

## Comparing Prevalences and Numbers

Estimates of the prevalence of vitamin A deficiency (VAD) in preschool children derived from two separate approaches are presented in Table 2.5. Despite the discrepancies in these estimates, which ultimately reflect the paucity of real data, it is clear that vitamin A deficiency remains a major public health problem of immense proportions.

Some features of the estimated prevalence are important to note. First, since both sets only estimate the number of young children with VAD, these are underestimates of the true magnitude of the global problem. VAD is a significant problem among school-age children and pregnant women in many countries. Data are not available to assess the magnitude of VAD in these groups. Second, the prevalence of VAD is not uniform across countries and regions. WHO estimates that 60 countries have VAD of public health significance.<sup>a</sup> The MI/UNICEF/Tulane study estimated that 78 countries are affected. The apparent rise in the number of countries affected is more likely the result of improved databases rather than any real trend in prevalence. We lack the data necessary to assess trends in VAD.

Clinical VAD, manifest as eye lesions, is decreasing.<sup>1</sup> It is not known whether VAD's impact on severe illness and mortality is decreasing, but with more national surveys and eventual trend estimates for VAD, it should be possible to make reasonable inferences about likely impact on vitamin A preventable mortality.

## Prevention and Control

The available data suggest that there is both an opportunity and a need to target major vitamin A control programmes to particular countries and to particular groups within affected countries. Unlike iodine, VAD is linked more to the nature of foods available and feeding practices than to geo-chemical or other conditions affecting the whole population of geographic areas. Many studies suggest that, like iron deficiency, VAD has strong socioeconomic associations. Indeed, iron deficiency and VAD often coexist in the same sub-populations.

**TABLE 2.5 : Estimated number of preschool children affected by clinical and subclinical vitamin A deficiency (VAD)**

Estimate	WHO/UNICEF <sup>a</sup> (million)	MI/UNICEF/ Tulane <sup>b</sup> (million)
Clinical VAD	2.80	3.30
Subclinical VAD	251	75 140

<sup>a</sup> 21.

<sup>b</sup> 22.

The great majority of countries where vitamin A deficiency is known to be a major public health problem have policies supporting the regular supplementation of children, an approach of known effectiveness that can reach the sub-populations affected by VAD. Supplementation coverage has increased significantly in the last few years, spurred on by the linkage of supplementation to immunization. Integrating the administration of vitamin A supplements with immunization services, which contact 80% of the world's children, has been WHO/UNICEF policy since 1994, although progress has been slow and somewhat limited. In contrast, the addition of vitamin A to polio vaccination campaigns has been quick to catch on and is proving to be one of the most successful implementation strategies for reaching large numbers of at-risk children. National Immunization Days (NIDS) offer a ready-made delivery infrastructure and unparalleled reach – in 1997 alone, more than 450 million children were immunized during polio NIDS. In 1998, 88% of the countries where VAD was a moderate to severe public health problem conducted NIDS, two-thirds of which included vitamin A, benefiting more than 24 million at-risk children. This success was the result of a coordinated strategic effort among UNICEF, WHO, major international donors, NGOs, and academic institutions.<sup>23</sup>

The main limitation of NIDS is that they provide the opportunity for only one dose of vitamin A per year, whereas vitamin A deficient children need to receive supplements at least twice a year. A minor setback has been the report that coupling vitamin A administration with immunization, while safe, may not have been as effective as had been hoped, at least in terms of reducing mortality.<sup>24</sup> Although dramatic progress has been made with supplementation coverage, the NIDS linkage should not be considered a universal panacea, and new approaches must be pursued.

<sup>a</sup> This estimate is based on the occurrence of clinical eye signs or symptoms or very low serum retinol levels ( $< 0.35 \mu\text{mol/L}$ ).

Almost all would agree that food-based approaches (including fortification where feasible) are the logical preferred long-term strategy. There is urgent need to expand fortification efforts where foods reaching the target population groups are processed or where local fortification is feasible. Advances are being made in these areas: fortification of maize is proving successful in Zimbabwe, and the first sugar fortification experience in Sub-Saharan Africa is moving forward in Zambia.<sup>23</sup>

Approaches based on modified food selection, improved availability of vitamin A rich foods, and possibly genetic modification of staple foods to enhance vitamin A availability, as with iron, have been slower to develop and more difficult to implement. However, progress is being made. Innovations include the promotion of egg consumption by small children in Indonesia, which has shown promising results.<sup>25</sup>

The recent finding, however, that the bioconversion of pro-vitamin A in dark green leafy vegetables is less than one-quarter of that previously thought has pointed to one reason why home gardening *per se* is seldom found to be directly associated with improved vitamin status.<sup>26</sup> Home gardening, nonetheless, has other important objectives, such as women's income generation, and so should be considered a useful complement to a longer-term strategy based on more effective interventions.

Promoting, protecting, and supporting breastfeeding remain essential components of vitamin A control programmes for young children, as does infectious disease control, not only through immunization, but also through complementary hygiene and sanitation interventions.

Finally, there is an urgent need for a good database of nationally representative surveys to help researchers better judge the impact of intervention programmes as well as the magnitude and location of the remaining VAD problem. The inter-agency Global Vitamin A Initiative has recommended as an end-of-2000 goal that all countries with populations affected by vitamin A deficiency or likely to be affected (based on infant and child mortality criteria<sup>b</sup>) should have a detailed, budgeted plan of action for eliminating vitamin A deficiency as a public health problem.<sup>27</sup>

## 2.4 Multiple Micronutrient Deficiencies

Many population groups in the developing world suffer from multiple nutrient deficiencies. The clustering of iron and vitamin A deficiencies has already been mentioned, but there are many more significant overlaps.

Moreover, deficiencies often interact. Vitamin A supplementation at appropriate levels has been found to improve not only vitamin A status but also iron metabolism in pregnant women and preschool and school-age children.<sup>28</sup> It should be considered where iron deficiency is common. A combined iron and vitamin A supplement has been found to be more than 40% more effective in reducing anaemia than an iron supplement alone. Such findings are not specific to supplementation. A vitamin A sugar fortification programme in Guatemala resulted in improved iron status of the population,<sup>29</sup> while a trial with vitamin A fortified MSG in Indonesia increased haemoglobin levels among children.<sup>30</sup>

Given such frequent overlaps and given the fact that at certain stages of the life cycle – most notably during pregnancy – it may be difficult for dietary needs to be met through diet alone, multiple micronutrient supplementation holds clear potential to address multiple nutrient deficiencies in a cost-effective manner. Recent advances have been made in this area since 1998. One publication has addressed key issues concerning the design and implementation of such programmes.<sup>31</sup> Also, a joint UNICEF/WHO/UNU workshop was convened in 1999 to consider the composition of a multi-micronutrient supplement to be used in forthcoming trials among pregnant women in developing countries.

## Summary

Progress has been made in reducing clinical vitamin A deficiency, but more needs to be done to reduce subclinical vitamin A deficiency, which has significant consequences. The success of salt iodization for controlling iodine deficiency disorders continues to spread; monitoring and sustainability are now key concerns. Iron deficiency and its most serious manifestation, anaemia, continue

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<sup>b</sup> A mortality rate for children under age five of 70 per thousand was proposed by WHO as a possible cut-off for delineating such countries.<sup>19</sup>

to undermine human potential. Unlike VAD and IDD, there is no clearly effective, widely applicable solution to iron deficiency, though a combination of approaches can make inroads. Operational research remains a major priority, as well as better advocacy for greater attention to combating this invisible scourge.

Overlaps and interactions between micronutrients are likely to be widespread, possibly affecting one in two children with any single deficiency. This fact argues strongly, both operationally and biologically, for multiple micronutrient supplementation and fortification. Such overlaps and interactions undoubtedly occur with regard to micronutrients we know relatively little about.

# 3 BREASTFEEDING AND COMPLEMENTARY FEEDING

**B**reastfeeding and complementary feeding behaviours are important predictors of infant and child nutrition, health, and survival. The vast majority of research has focused on the benefits of breastfeeding and complementary feeding to infants and young children, although there are also important benefits throughout the life cycle. There is evidence to link having been breastfed as a child with stronger intellectual development<sup>1–3</sup> and a reduced risk of cancer,<sup>4</sup> obesity,<sup>5</sup> and several chronic diseases.<sup>6,7</sup> Breastfeeding also benefits maternal health. Women who breastfeed have a reduced risk of ovarian cancer and premenopausal breast cancer.<sup>8–10</sup> Women who were breastfed as infants also have a reduced risk of breast cancer.<sup>11</sup>

Improving breastfeeding and complementary feeding practices will therefore improve health, nutrition, and survival in the short as well as the long term and contribute to the well being of future generations. Because of the increasing recognition of the importance of foetal and early childhood nutrition throughout the life cycle, data on breastfeeding and complementary feeding are included for the first time in an ACC/SCN report on the world nutrition situation.

## 3.1 Evidence Linking Breastfeeding to Improved Outcomes

Breastfeeding contributes to infant nutrition and health through a number of important mechanisms. It provides a complete source of nutrition for the first six months of life, half of all requirements in

the second six months of life, and one-third of requirements in the second year of life.<sup>12</sup> It provides immunity as well as other factors that protect against specific illnesses. When infants and children become ill, breastfeeding provides an important source of nutrients because intake of breastmilk is not reduced in contrast to the intake of complementary foods, which declines considerably.<sup>13–15</sup> Furthermore, exclusive breastfeeding<sup>a</sup> eliminates the risk of illness through the use of contaminated foodstuffs and utensils. It also lengthens the period of postpartum amenorrhoea and hence, in the absence of contraceptive use, lengthens the birth interval, which is strongly related to infant and child survival.

Because infant feeding mode cannot be randomly assigned, all data on the protective effect of breastfeeding on morbidity and mortality are observational. However, the dose-response effect observed with exclusive breastfeeding, any breastfeeding, and no breastfeeding provides evidence of causality.<sup>16–19</sup> The risk of death decreases dramatically as the infant ages; therefore the protective effect of breastfeeding on mortality is greatest in the first month of life and declines by month until 6 months.<sup>20</sup> Many though not all studies continue to show protective effects until 12 months of life, and some studies show protective effects into the second year as well. A dose response has also been observed between the amount of breastmilk consumed through a naso gastric tube in preterm infants and cognitive development<sup>1</sup> and between a longer duration of exclusive breastfeeding and reduced risk of obesity among school-age children.<sup>5</sup> A similar pattern is observed with the protective effect of breastfeeding on morbidity, with the protective effects being greatest in the first 6 months of life and reduced thereafter.<sup>17,18</sup>

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<sup>a</sup> Breastfeeding with no other food or fluid given to the child, not even water.

### 3.2 Evidence Linking Complementary Feeding to Improved Outcomes

It is difficult to meet the zinc and iron requirements of children 6 to 24 months even in the best conditions.<sup>12</sup> Inadequate micronutrient and energy intake is often coupled with a high prevalence of both clinical and subclinical morbidity, which is often associated with anorexia. This is the period of active growth faltering. Interventions to improve intake of complementary foods can result in improved infant and child growth among populations at risk of undernutrition. A review of efficacy trials and programmes in 14 countries showed that child growth could be improved by 0.10 to 0.50 standard deviation (SD) through increased dietary intakes. This range of improvement in growth would reduce prevalences of undernutrition ( $< 2$  SD) at 12 months by 1–19%.<sup>21</sup> The effects of improved nutritional intake on growth are greatest in the first year of life, though significant effects continue into the second and third year.<sup>22,23</sup> Nutritional status during the first two years of life, which coincides with the period of peak diarrhoeal disease and high prevalences of respiratory infections, is particularly important in light of the fact that adequate nutrition mitigates the negative effect of diarrhoea on linear growth.<sup>24</sup>

In Central and South America and the Caribbean there is renewed interest in the role that processed complementary foods can play in providing a nutritionally complete infant and toddler food.<sup>25</sup> Processed complementary foods, appropriately fortified, can complement breastmilk and traditional foods during the nutritionally vulnerable period. Because these foods can be produced inexpensively and require minimal time for preparation and cooking, they alleviate other economic and time-related constraints to improved child feeding. Risk of food contamination may also be reduced through good packaging. Despite these advantages, processed complementary foods have not been shown to be effective outside the research setting at improving the nutritional status of children at risk of undernutrition. Sustainability is also an issue. Inadequate attention has been given to cultural acceptability, as well as cost and financing, social marketing, targetting, and distribution. Processed complementary foods often fail to reach the poorest households, and when they do, breastfeeding practices and other key feeding behaviours have not been improved simultaneously.

### 3.3 Conceptualizing Infant Feeding Behaviours

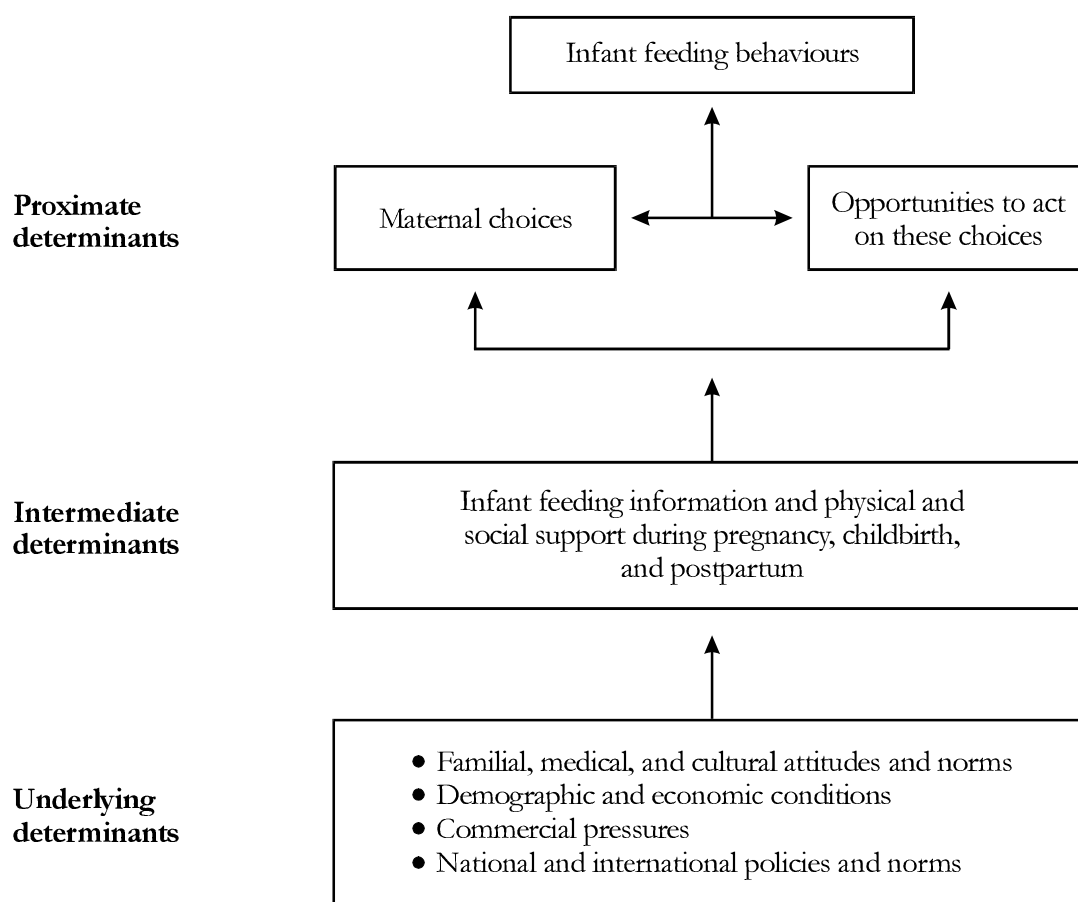
The full impact of optimal breastfeeding and complementary feeding, as measured by population level reductions in mortality and morbidity and improved health and development, will never be realized unless women and caregivers adopt recommended behaviours. Recommended behaviours change as an infant and young child grows.<sup>12</sup> WHO defines optimal behaviours as exclusive breastfeeding for four to six months, breastfeeding with complementary feeding starting at about six months of age, and continued breastfeeding in the second year of life and beyond.<sup>26</sup> Field studies show that complementary foods introduced between four and six months of age replace nutrients from breastmilk and confer no advantage on growth or development.<sup>27,28</sup> As a result UNICEF and many ministries of health in general recommend exclusive breastfeeding for about six months. Having two sets of recommendations creates confusion, and policy harmonization is urgently needed in this area.

Whether or not optimal behaviours are adopted is a result of the interaction of many factors. The closest determinants relate to a woman's choice and her ability to act upon this choice. For optimal breastfeeding and complementary behaviours to occur, a woman must both wish to use them and be able to choose them. The two factors are influenced most immediately by the infant feeding information a woman receives as well as the physical and social support provided to her during pregnancy, childbirth, and postpartum. These factors are, in turn, influenced by familial, medical, and cultural attitudes and norms, demographic and economic conditions (including the resources to grow or purchase needed foods and maternal employment), commercial pressures, and national and international policies and norms. Thus, to promote optimal breastfeeding and complementary feeding behaviours, interventions need to be targeted not only to individual women but also to changing the context in which infant and child feeding choices are made.

The determinants of infant feeding behaviours are shown in Figure 3.1. This figure elaborates the interplay between factors that determines the capacity, resources, and care practices for young children.



**FIGURE 3.1 : Determinants of infant feeding behaviours**



Source: 29.

### 3.4 HIV and Infant Feeding

The finding that HIV is transmitted through breast-milk has complicated infant feeding recommendations.<sup>30</sup> Recognizing breastfeeding as a significant and preventable mode of HIV transmission, the Joint United Nations Programme on HIV/AIDS (UNAIDS), together with WHO and UNICEF, issued new guidelines on HIV and infant feeding in 1998.<sup>31</sup> These guidelines call for urgent action to educate, counsel, and support HIV-positive women in making decisions about how to nourish their infants safely. The guidelines stress that in order for a mother to make a decision, she must have access to voluntary and confidential testing and counselling, as well as to information about feeding options and the risks associated with them.

Since these guidelines were published, observational data have shown that three-month-old infants of HIV-positive women who were exclusively breastfed have the same risk of contracting HIV as infants who were never breastfed. In contrast, infants who were partially breastfed had a significantly higher risk.<sup>32</sup> Several biological mechanisms could explain why exclusive breastfeeding might be more protective than partial breastfeeding. These include the mother's reduced risk of subclinical mastitis, which occurs during breast engorgement,<sup>33</sup> and increased integrity of the infant's intestinal wall. Research is under way to confirm if these important findings are causal.

Shortened duration of breastfeeding is one infant feeding option suggested in the new UNAIDS/WHO/UNICEF guidelines. Confirmation of the protective effect of exclusive breastfeeding on the

risk of mother-to-child transmission of HIV is a necessary first step in developing a policy recommendation that would give infants the benefits of exclusive breastfeeding while avoiding the risk of HIV transmission through partial breastfeeding.

### 3.5 Breastfeeding and Complementary Feeding Patterns and Trends

This section uses data from nationally representative household demographic and health surveys to provide trend information on breastfeeding, complementary feeding, and bottle feeding. Data are presented from national surveys conducted with technical support from the Demographic and Health Surveys (DHS). Current status data are used to determine infant feeding patterns to avoid problems associated with recall bias. Surveys from 1990 to 1996 reporting on current infant and childhood feeding patterns are available for 37 countries. Twenty-seven countries supported by DHS or World Fertility Surveys have multiple surveys that permit analysis of trends of breastfeeding initiation and of the median duration of breastfeeding covering the period 1975 to 1996. These data were published in June 1999 by Macro International in a report titled *Breastfeeding and Complementary Feeding, and the Postpartum Effects of Breastfeeding*.<sup>34</sup> In addition, analysis of DHS data for Latin America and the Caribbean by the Pan American Health Organization permits presentation of trends in exclusive breastfeeding for the years 1986 to 1996.<sup>35</sup>

This review shows that breastfeeding initiation rates are very high in developing countries. The incidence of breastfeeding initiation exceeds 90% in almost every country and exceeds 95% in more than half of the countries. Breastfeeding initiation is universal in Sub-Saharan Africa. However, breastfeeding practices are far from optimal. The recommendation for exclusive breastfeeding is not widely practiced (Table 3.1). In general, the proportion of infants under four months of age who are exclusively breastfed is highest on average in Asia (up to 82% in Nepal) and the Near East/North Africa (63% in Morocco) followed by Latin America and Sub-Saharan Africa. There is significant variation within regions. For example, in Latin America and the Caribbean, the proportion of infants under four months of age who are exclusively breastfed ranges from less than 5% in Haiti to more than 50% in Bolivia, Guatemala, and Peru.

WHO and others recommend that all infants six to nine months of age be breastfed and also receive complementary foods. Data on breastfeeding plus complementary foods shown in Table 3.1 reflect the timing of introduction of complementary foods but provide no information about the quality of these foods. Again there is large variation within regions. For example, in Sub-Saharan Africa one-third of infants in Ghana and Mali are receiving complementary foods, compared with 90% or more in Kenya and Zimbabwe. In general, low prevalences for this indicator in Latin America and the Caribbean are because infants are no longer being breastfed rather than because they are not receiving complementary foods. Delayed introduction of complementary foods is a serious problem in some countries. Less than one-third of infants receive complementary foods by six to nine months in Bangladesh, India, and Pakistan, according to surveys conducted in the early 1990s.

The prevalence of breastfeeding between 12 and 15 months is relatively high in all regions. In Sub-Saharan Africa 13 of the 18 countries reported here have breastfeeding rates exceeding 90%. For other regions, again, there is significant variation. In Latin America and the Caribbean, breastfeeding at 12–15 months ranges from a low of 30% in the Dominican Republic and 35% in Brazil to about 80% in Guatemala, Haiti, and Peru. Prevalences of breastfeeding among children 20–23 months of age are highest in Sub-Saharan Africa and Asia (over 50%) and lowest in Latin America and the Caribbean and the Near East/North Africa (about 25%).

Bottle feeding carries a significant risk of morbidity because of contamination<sup>36</sup> and is therefore a useful indicator to follow. Bottle feeding is highly variable, depending on the region and the country. In general, it is lowest in Sub-Saharan Africa, although one-third of infants are bottle fed in the first four months in Namibia and Nigeria. Bottle feeding rates are very high in Latin America and the Caribbean. In four of the eight countries reported on, more than half of infants less than four months are bottle fed. A very high rate of bottle feeding is reported for Kazakhstan in Central Asia (69%), whereas rates are much lower elsewhere in Asia—for example, 9.2% in India.

Overall, data on trends in the median duration of breastfeeding show positive changes between 1975 and 1996 (Table 3.2). The high median duration of breastfeeding was maintained in many countries and actually increased in some. Increases in the

**TABLE 3.1 : Breastfeeding and complementary feeding practices**

Region, country, and date	Exclusive breastfeeding, < 4 months (%)	Breastfeeding plus complemen- tary foods, 6 9 months (%)	Breastfeeding, 12 15 months (%)	Breastfeeding, 20 23 months (%)	Bottle feeding, < 4 months (%)
<b>Sub-Saharan Africa</b>					
Burkina Faso 1993	3.1	43.9	98.0	81.7	1.6
Cameroon 1991	7.3	77.1	80.7	37.8	17.8
Central African Republic 1994 95	4.4	93.1	96.6	54.8	2.3
Côte d Ivoire 1994	3.4	66.2	94.9	47.5	4.5
Ghana 1993	8.3	35.7	94.6	55.4	23.9
Kenya 1993	17.0	90.1	91.3	57.6	16.4
Madagascar 1992	48.4	80.0	91.1	51.7	3.7
Malawi 1992	3.3	87.2	94.5	59.9	3.8
Mali 1995	12.2	32.9	94.3	62.8	2.9
Namibia 1992	21.6	64.7	69.1	24.8	31.1
Niger 1992	1.3	73.2	96.3	63.7	2.1
Nigeria 1990	1.4	51.7	86.9	46.3	33.6
Rwanda 1992	90.2	67.8	98.6	89.0	0.7
Senegal 1992 93	6.5	58.9	94.1	50.6	6.2
Tanzania 1991 92	32.5	58.7	94.7	59.5	4.1
Uganda 1995	70.4	63.6	88.5	45.0	5.6
Zambia 1992	13.3	87.6	91.1	34.9	3.2
Zimbabwe 1994	16.3	93.0	89.8	26.7	5.8
<b>Near East/North Africa</b>					
Egypt 1992	54.0	52.3	77.9	42.4	19.9
Jordan 1990	32.0	48.1	48.3	17.2	29.8
Morocco 1992	62.9	35.1	64.6	31.7	23.1
Turkey 1993	13.9	47.1	47.5	18.2	29.4
<b>Asia</b>					
Bangladesh 1993 94	53.5	29.4	96.1	91.2	0.0
India 1992 93	51.2	31.5	89.0	73.0	9.2
Indonesia 1994	47.6	85.8	88.8	76.6	10.6
Kazakhstan 1995	12.3	62.7	52.3	24.1	69.0
Nepal 1996	82.0	62.5	96.7	92.7	2.3
Pakistan 1990 91	25.1	29.2	79.7	59.4	26.2
Philippines 1993	33.1	52.1	58.2	24.2	43.0
<b>Latin America/Caribbean</b>					
Bolivia 1993 94	54.0	78.0	74.7	42.7	34.7
Brazil 1996	40.8	11.6	34.8	18.8	50.9
Colombia 1995	15.7	61.5	42.8	18.8	72.0
Dominican Republic 1991	9.6	22.8	29.5	9.1	80.8
Guatemala 1995	50.7	55.7	78.0	54.0	26.4
Haiti 1994	3.3	84.1	82.4	26.7	36.4
Paraguay 1990	7.0	61.2	40.3	11.1	56.1
Peru 1996	61.4	72.2	81.6	45.8	28.6

Source: Abstracted or calculated from information presented in 34.

**TABLE 3.2 : Trends in the median duration of breastfeeding**

Region, country, and date	Median duration (months)	Region, country, and date	Median duration (months)
Sub-Saharan Africa		Asia	
Cameroon 1978	17.8	Bangladesh 1975-76	25.8
Cameroon 1991	18.2	Bangladesh 1993-94	36.0
Ghana 1979-80	17.8	Indonesia 1976	23.3
Ghana 1988	21.5	Indonesia 1987	23.3
Ghana 1993	21.6	Indonesia 1991	23.6
		Indonesia 1994	23.7
Kenya 1977-78	16.6		
Kenya 1989	20.0	Nepal 1976	24.2
Kenya 1993	21.6	Nepal 1996	31.3
Mali 1987	18.6	Pakistan 1975	17.8
Mali 1995	22.5	Pakistan 1990-91	18.5
Nigeria 1982	17.0	Philippines 1978	14.1
Nigeria 1990	19.8	Philippines 1993	15.4
Rwanda 1984	20.9		
Rwanda 1992	28.0	Latin America/Caribbean	
		Bolivia 1989	16.4
Senegal 1978	18.0	Bolivia 1993-94	17.5
Senegal 1986	18.9		
Senegal 1992-93	20.2	Brazil 1986	5.8
		Brazil 1996	7.8
Uganda 1988-89	19.5		
Uganda 1995	19.3	Colombia 1976	7.9
		Colombia 1986	9.1
Zimbabwe 1988-89	19.1	Colombia 1990	9.3
Zimbabwe 1994	18.1	Colombia 1995	10.3
Near East/North Africa		Dominican Republic 1975	8.4
Egypt 1980	15.3	Dominican Republic 1986	8.1
Egypt 1988-89	19.8	Dominican Republic 1991	5.9
Egypt 1992	19.8		
		Guatemala 1987	20.6
Jordan 1976	10.9	Guatemala 1995	20.2
Jordan 1990-91	12.1		
		Haiti 1977	15.6
Morocco 1980	15.9	Haiti 1994	17.7
Morocco 1987	15.4		
Morocco 1992	15.5	Paraguay 1979	12.4
		Paraguay 1990	11.7
Turkey 1978	11.7		
Turkey 1993	11.7	Peru 1977-78	14.5
		Peru 1986	14.1
		Peru 1991-92	18.1
		Peru 1996	20.2

Source: 34.

median duration of breastfeeding measured over a ten-year period range from about one month in the Near East/North Africa to 2.5 months in Sub-Saharan Africa. When all countries were considered together, the median duration of breastfeeding in-

creased at a rate of 1.7 months per decade. Work is under way to extend the analysis of trends in breastfeeding and complementary feeding by developing comprehensive indicators of care. This work is described in Box 3.1.

### BOX 3.1

## Approaches to Measuring and Quantifying Care

Care is defined as the behaviours and practices of caregivers (mothers, fathers, siblings, and child-care providers) to provide the food, health care, stimulation, and emotional support necessary for children's healthy growth and development.<sup>37</sup> Over the past decade, care has been increasingly recognized as a crucial input into child health and nutrition, along with food security, availability of health services, and a healthy environment.

In 1995 a special issue of the *Food and Nutrition Bulletin* presented an extensive review of the literature on care and its determinants and provided recommendations for protecting and enhancing the quality of care. A useful distinction has also since been made between care resources and care practices. The latter includes the following six main areas of caregiving behaviours: (1) care for women; (2) feeding/breastfeeding; (3) psychosocial and cognitive stimulation; (4) hygiene practices; (5) home health practices; and (6) food preparation and storage. Indicators for measuring care were also identified.

In 1997 WHO, along with IFPRI and the University of Ghana, undertook a survey in Accra using the food-health-care conceptual model to examine the determinants of child undernutrition. One of the greatest challenges was to identify an approach to measuring and quantifying care. Data on child feeding practices and use of preventive health services were collected, and the information was used to create an age-specific child-care index. The index

was particularly useful in examining the importance of care for child undernutrition and in studying the determinants of caring practices in this population. The main findings were (1) good care practices for children 4–36 months of age were beneficial for child nutritional status and could partially compensate for the negative effects of low maternal schooling and poverty; (2) the most important constraint to good child care practices was maternal schooling; and (3) household socioeconomic factors, food security, maternal work, and other maternal characteristics did not interfere with caring practices in this population.<sup>38,39</sup>

In collaboration with Cornell University and Emory University, IFPRI is now using DHS data sets to pursue its work in measuring and quantifying care. The focus is on using the information available on breastfeeding and complementary feeding to derive a child feeding index for various countries and regions around the world. Preliminary work shows promising results, and the findings should help improve our understanding of the role of care in the etiology of childhood undernutrition in different settings. The research will also help identify minimum data needs and useful indicators for measuring and quantifying care. The current focus is on child feeding practices because of data availability, but research is urgently needed on indicators and methodologies to quantify other more complex aspects of care, such as psychosocial and cognitive stimulation or care of women, which remain largely understudied. ■

### 3.6 Role of National and International Initiatives in Support of Optimal Infant Feeding

Improvements in breastfeeding behaviours have occurred at the same time as demographic changes, such as increased urbanization and increases in hospitalization for childbirth, female education and employment, and use of modern contraceptives, which traditionally have been negatively associated with breastfeeding.<sup>40</sup> The role of national and international initiatives in support of breastfeeding and complementary feeding in light of these positive changes is noteworthy.

In response to concerns about changing breastfeeding behaviours with negative consequences for infant health, a number of national and international initiatives have been implemented to promote breastfeeding. Three have been particularly important:

1. The International Code of Marketing of Breast-milk Substitutes adopted by the World Health Assembly in 1981<sup>41</sup> and subsequent relevant World Health Assembly resolutions, collectively known as *The Code*, provide guidelines for the marketing of breastmilk substitutes, bottles, and teats. To ensure infant feeding decisions free from the influence of marketing pressures, the Code aims to restrict such practices, including direct promotion to the public. Furthermore, World Health Assembly resolutions<sup>b</sup> urge that there be no donations of free or subsidized supplies of breastmilk substitutes and other products covered by the Code in any part of the health care system. The Code has been adopted by many governments, either as a norm or through legislation. Despite a mixed record of compliance by infant formula manufacturers,<sup>42</sup> it has had a major impact on the way formula is advertised and marketed. The Code has been particularly effective in the virtual elimination of the direct marketing to women who receive services through the public sector and in the restriction of marketing to health providers. The legal status of the Code, by country, is presented in Appendix 10.
2. The Innocenti Declaration, which focuses on the need to protect, promote, and support breastfeeding, was signed by more than 30 countries in 1989. One operational target of this declaration is the universal implementation of the Ten Steps to Successful Breastfeeding, which forms the basis for the third major initiative: the WHO/UNICEF Baby Friendly Hospital Initiative.
3. The WHO/UNICEF Baby Friendly Hospital Initiative was endorsed by the Forty-Fifth World Health Assembly in 1992.<sup>43</sup> This initiative has influenced the routines and norms of hospitals throughout the world through the Baby Friendly certification process. A hospital is designated as Baby Friendly when it has agreed not to accept free or low-cost breastmilk substitutes, feeding bottles, and teats and to implement the Ten Steps. To date, more than 14,500 hospitals in 142 countries have been certified, and many others are attempting to become certified.<sup>44</sup>

### 3.7 Looking Forward: The Importance of Exclusive Breastfeeding

Breastfeeding is widely practiced throughout the developing world and is actually improving in spite of demographic trends, such as urbanization, which exert a downward pressure.<sup>40</sup> Nonetheless, there is a need to increase the duration of exclusive breastfeeding because this breastfeeding behaviour is most associated with infant health and survival. Three published studies have demonstrated the effect of breastfeeding promotion on the duration of exclusive breastfeeding.<sup>45-47</sup> Interpersonal counselling was the key intervention. Breastfeeding promotion is one of the most cost-effective interventions to promote child health and is comparable to immunizations.<sup>48</sup>

Increasing the duration of breastfeeding does not necessarily lead to increases in the duration of exclusive breastfeeding. In Bolivia and Colombia, the duration of partial breastfeeding has increased at the same time the duration of exclusive breastfeeding has decreased. However, in countries where a concerted effort has been made to increase exclusive breastfeeding, shifts in

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<sup>b</sup> Resolution 39.28 passed in 1986 deals with specially formulated milks (so-called follow-up milks). Resolution 47.5 passed in 1994 deals with removing obstacles and preventing interference that mothers may face.

population-level behaviours have been noted. In the Dominican Republic and Peru, the proportion of infants under four months of age who were exclusively breastfed doubled between 1991 and 1996 and between 1986 and 1996, respectively.<sup>29</sup>

The timing of interventions to promote the desired breastfeeding and complementary feeding behaviour is critical because it is likely to affect a mother's decision-making, her motivation to overcome problems should they arise, and her persistence in maintaining a recommended behaviour despite negative influences. Therefore, interventions need to be delivered as close as possible to the time of the desired behaviour. Exclusive breastfeeding declines precipitously in the first month of life. Evidence shows that in the short term women can be encouraged to return to exclusive breastfeeding with counselling.<sup>46</sup> However, once women cease exclusive breastfeeding they usually do not resume. Therefore, reaching women during the prenatal period, soon after delivery, and within the first month postpartum is critical to increasing the duration of exclusive breastfeeding.

The challenge from a public health perspective is to translate the vast scientific literature on breastfeeding and complementary feeding recommendations to

effective interventions that are understood and accepted by the population at large. To some extent lessons learned from campaigns to promote breastfeeding can provide guidance. However, as important as breastfeeding is to infant health and survival, it is also necessary to look beyond breastfeeding and to integrate both breastfeeding and complementary feeding in campaigns to promote optimal nutrition of both the infant and young child. As noted in a recent review, providing safe and adequate amounts of foods appropriate for infants and young children is not simple.<sup>21</sup> Complementary foods must be adequately dense in energy and micronutrients to meet the requirements of this age group. They must also be prepared, stored, and fed in hygienic conditions to reduce the risk of diarrhoea. Lastly, many feeding behaviours that affect infant and child nutritional status need further study. Qualitative and quantitative research is necessary, along with cost-effectiveness analysis. However, research is not sufficient to guarantee the success of public health interventions. The international community must work together to ensure that the same rigor applied to such research is applied to broad-scale interventions, to bring the benefits of nutrition research to those who need it most.

# 4 NUTRITION AND HUMAN DEVELOPMENT

**F**ew people – whether or not they are nutrition professionals – would dispute the fact that malnutrition constrains people's ability to fulfill their potential. Hungry and undernourished people have less energy to undertake work, are less able to attend school, and once in school are less able to concentrate and learn. Diet-related chronic diseases take highly experienced individuals out of the work force and take resources away from primary health services. That improved nutritional status will lead to an improved ability to secure rewarding and sustainable livelihoods is a common sense proposition.

How important is malnutrition to economic growth? Researchers have derived conservative estimates of the forgone gross domestic product (GDP) as a result of iron deficiency alone in childhood and iron, iodine, and protein-energy malnutrition in adults.<sup>1</sup> For Pakistan the annual losses are over 5% of GDP. For Bangladesh, the cost of iron deficiency in children alone is nearly 2% of GDP. Nutrition and food security also promote economic growth by reducing the potential for conflict.<sup>2</sup> Chapter 5 shows that the resources required for relief activities are large and growing. Understandably these activities retain the first call on resources – resources that could otherwise be allocated to longer-term development activities. The designers and implementers of relief programmes are very aware of the importance of building development into relief activities. In general, the need for future relief flows can be reduced by improving nutrition today. Reduced relief flows will increase the availability of funds for longer-term development. Improvements in nutrition can thus serve as a crucial spur to overall economic growth.

If the contributions of nutrition to economic development are underrated, so too are the reverse contributions – both positive and negative. Economic and demographic events such as globalization, HIV/AIDS, and urbanization have large and far-reaching impacts

on human development – such as the capability to be well nourished and healthy, to undertake healthy reproduction, and to be educated and knowledgeable – and they must be taken into account in developing nutrition strategies.

The emergence of human development as a guiding principle for overall development reflects a growing dissatisfaction with an exclusive reliance on economic growth as a means to development. The focus on human capabilities has opened the door for more normative arguments, including a human rights based approach to development. In his launch of the United Nations reform, Secretary General Kofi Annan stated that all major UN activities should be undertaken through a human rights perspective. Many UN agencies, particularly the UNDP, UNFPA, UNHCR, and UNICEF, began operationalizing a human rights approach to development. The debate about whether or not the UN should base its work on human rights was over. The challenge now is how to develop human rights based strategies.

This chapter discusses these themes in more detail. First, it describes some recent developments that highlight the contributions of improved nutrition to the overall development process. Recent studies, for example, confirm the strong relationship between infant nutrition, cognition, and school enrollment – linkages exploited by the early childhood initiatives of the past five years. The chapter then considers some of the policy implications of new research on the links between foetal undernutrition and diet-related chronic diseases in adults. This section of the chapter closes with a discussion of the resurgence of interest in participatory development approaches and the contributions that community-based nutrition initiatives might make to overall development.

Second, the chapter describes some major socioeconomic and demographic events together with their implications for nutrition policy and programming. The chapter considers the implications of the freer movement of financial resources, food, and



information (three aspects of globalization) for food and nutrition policy. The chapter then discusses the implications of rapid urbanization and of HIV/AIDS for food and nutrition policy. Finally, the chapter describes the emergence of the human rights perspective. The ascent of the human rights agenda in an era of globalization is more than a coincidence. Human rights principles will play a crucial role in the type of globalization that emerges over the next ten years.

## **4.1 The Relevance of Nutrition for Development**

Three emerging bodies of work highlight the nature of the link between nutrition and human development: (1) nutrition, cognition, and school enrollment, (2) foetal nutrition and adult chronic disease, and (3) the importance of community-based approaches to development and the leadership of the nutrition community in this regard.

### **Nutrition, Cognition, and School Enrollment**

Recent studies from the nutrition and economics literatures reaffirm the importance of nutrition for the cognitive achievement and school enrollment of children. In addition, study after study demonstrates that women's educational attainment is a key factor in preventing infant undernutrition<sup>3</sup> and that overall educational attainment is the key factor in escaping poverty.<sup>4</sup>

Recent nutrition studies confirm the strength of these relationships. Strong associations are found between the stunting of Filipino children under age 2 and their cognitive ability test scores between ages 8 and 11.<sup>5</sup> There is a strong link between sub-optimal neonatal nutrition and cognitive function, particularly in males.<sup>6</sup> In Jamaica stunting was strongly associated with developmental levels in 1- and 2-year-olds.<sup>7</sup> Nutritional supplementation and stimulation of stunted children between 9 and 24 months of age have independent and additive effects on the development of the children at the age of 7–8 years.<sup>8</sup>

The economics literature offers compelling evidence of the importance of nutrition for development. At the mean of a nationally representative sample from Ghana, a 10% increase in stunting causes a 3.5% increase in age of first enrollment at

school.<sup>9</sup> For Pakistan, an improvement of 0.25 in Z-score height-for-age will lead, on average, to an increase in subsequent school enrollment rates of 2% for boys and 10% for girls. This increases to 5% and 16%, respectively, when diarrhoea rates are reduced by half.<sup>10</sup> Another recent study yields smaller impacts on child schooling performance, but the link is still statistically significant.<sup>11</sup>

Given that these findings come from both experimental design and observational data and from both the nutrition and economics literatures, and that stringent statistical and econometric techniques have been used to generate them, they present a convincing and scientific basis for early childhood interventions.

### **Policy Implications of the Link between Foetal Undernutrition and Adult Chronic Disease**

Evidence on the links between foetal undernutrition and chronic disease in adulthood has been discussed in Chapter 1. The implications of these links for formulating development policies are only now being thought through. Three points are noteworthy. First, an investment in avoiding foetal undernutrition becomes an even better investment because it not only improves maternal and infant nutrition but also slows down or prevents the onset of chronic diseases in later life. Of course, preventing these effects is intrinsically valuable, as emphasized by the human rights approach. In addition, prevention will have a significant impact on economic productivity – an impact that has not been captured in conventional estimates of the economic returns to improved nutrition.

Second, increasing health expenditures – whether private or public – to modify behaviour and prevent undernutrition throughout the life cycle may well diminish or at least postpone health expenditures to later in life. This postponement will better allow ageing populations to lead productive adult lives, thus enabling them to better insure themselves – formally or informally – against health shocks. Third, if the allocation of public health resources is to be guided by the global burden of disease metrics such as disability-adjusted life years lost (DALYs), then the new findings will lead to an enormous increase in the rationale for investing in adolescent, maternal, foetal, and infant nutrition, simply because foetal undernutrition is a leading cause of such major components of the global burden of disease as cardiovascular disease, hypertension, and obesity.

## **Decentralization and the Empowerment of Communities**

Many institutions throughout the world are rapidly decentralizing the allocation of public resources whether health and nutrition or otherwise. In principle, moving authority and accountability closer to the intended beneficiaries of an initiative—poor communities, for example—is likely to strengthen the incentives to use public funds more effectively and to facilitate the generation of complementary private funds. In practice, however, mechanisms to ensure sufficient local capacity and accountability have to be present as well. Communities also have embedded power structures, and in the absence of transparency and accountability mechanisms, local groups can misallocate funds. Moreover, if local communities are to compete for central funds, the better-equipped, more-cohesive, and less-excluded communities will capture them. Communities that are unable to organize proposals or are less likely to be noticed by central authorities will lose out.

The nutrition community has taken leadership in this area. Community-based nutrition programming has long been considered a vital component of the fight against malnutrition.<sup>12</sup> Can these community-based efforts serve as a way of empowering communities to participate in other development activities? The body of quantitative empirical research on how community participation affects the performance of development projects is small but growing. The two studies that use data from a large number of projects and have paid most attention to the econometrics issues find that community participation leads to improved project performance.<sup>13,14</sup> Further, community-based lending schemes have higher repayment rates if their membership has higher indicators of social cohesion.<sup>15</sup> In addition, there is a rapidly growing body of work linking membership in social and economic groups to accelerated upward income mobility.<sup>16</sup>

Ideally, data on a large number of nutrition projects will become available so that similar analyses can be undertaken. Can nutrition programs empower communities beyond their immediate concerns? And can community-based nutrition initiatives foster an increasing adherence to human rights by a wide range of actors? These questions remain to be answered, but the signs are promising. Several community nutrition projects have served to stimulate other decentralized development activities. In Sri Lanka, for example, the nutrition component of a World Bank-supported poverty

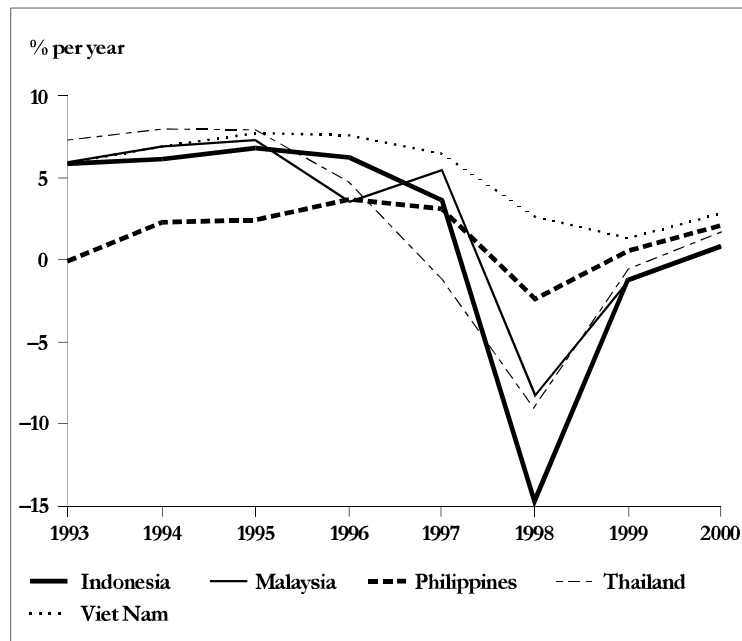
alleviation project used participatory approaches to enhance nutrition awareness and improve feeding practices. The project used nutrition as an entry point to poverty alleviation, by combining it with community infrastructure development, savings, credit, and micro-enterprise development in a phased manner. In a setting characterized by top-down development planning, the project demonstrated that community ownership could accelerate positive change.<sup>17</sup>

## **4.2 The Implications of Some Global Phenomena for Nutrition**

The globalization of financial markets in the absence of appropriate oversight and governance has led to financial crisis, which in East Asia has turned into a human resource crisis. We highlight these relationships and their implications for public policy with a case study of Indonesia—the country that has been hardest hit by the Asian crisis in terms of investments in children. Increasing trade liberalization is generally thought to spur overall economic growth. But the increasing openness of developing-country markets to food combined with the failure of developed countries to reciprocate may well produce a situation that denies developing countries access to high-income markets for their exports. In addition, different standards of food safety between importers and exporters may lead to concerns about the safety of imported food. As food safety concerns heighten, the use of food safety as a trade barrier against exports from developing countries may become a more pressing concern. We also consider the implications of the decreasing costs of information flows, including how the new information and communication technologies can be best used to help accelerate reductions in malnutrition. The freer flow of capital and people across national boundaries has been mirrored by an increasing migration from rural to urban areas, and the implications of this increased rate of migration are discussed in this section of the chapter as well.

### **Globalization of Financial Resources and the East Asian Crisis: Implications for Nutrition**

The East Asian financial crisis, which began in July 1997, is a reminder of how unreliable the past can be as a guide to future events. In one year (1997–98), per

**FIGURE 4.1 : Growth rate of GDP per capita in South-East Asian countries, 1993–2000**

Source: 18.

capita growth rates in East Asia fell sharply. The worst hit was Indonesia, where per capita growth declined from 3.3% to -14.8% (Figure 4.1).

### THE UNFOLDING OF THE CRISIS

The crisis occurred as a result of many complex factors. First, and largely in retrospect, the economic outlook of the region had been worsening since the mid-1990s. The increasing strength of the dollar, to which the currencies in the region were linked, made East Asian exports less competitive. Japan, a major consumer of exports from the region, experienced slow growth, and China was becoming an increasingly powerful export competitor. Second, the opening up of East Asian financial systems led to a massive flow of private capital into the region. Given the low interest rates in the industrialized countries and the recent good economic performance in East Asia, foreigners began investing heavily in the region. The inflow of private capital accelerated because of assurances—implicit and explicit—from the region's governments that they would underwrite or guarantee repayments. On the other side of the coin, East Asian companies could now borrow from sources overseas. Because currencies were linked with the dollar, repayments from East Asian companies would be more predictable and involve lower risk. This easier access to less risky credit led to investment in riskier and lower-performing

projects. Third, the region's financial systems did not respond to the need for greater supervision and oversight in a more deregulated environment.

The trigger event was Thailand's large and rapidly growing current account deficit (exports minus imports minus interest payments on foreign debt) in 1996–97. This deficit led foreign investors to sell their assets in the region, redeeming them for dollars at the dollar-linked exchange rate. Investors did this because they feared that regional governments would run out of foreign currency to maintain a linked exchange rate and be forced to depreciate the currency. When depreciation occurs, the holdings of foreign investors lose

value and, fearing further depreciation, investors sell more assets, leading to a self-fulfilling cycle of currency depreciation. This asset sell-off and the accompanying depreciation can and did spread to other countries via fear, trade, and financial markets. The depreciation and the massive outflow of private capital led to company bankruptcies and sharp price increases for imported goods. The stock markets of the region also declined because of a loss of investor confidence, with an accompanying loss in wealth, and hence in local demand. Increases in unemployment followed as did declines in the real wages of the employed due to inflation.<sup>18–21</sup>

The effects of the crisis on indicators such as nutrition and educational attainment will play out well beyond the upturn in GDP per capita. How has the crisis affected poverty, education, and nutrition? Moreover, what does the crisis mean for improving public policy to minimize the impacts of future shocks and crises? A case study of Indonesia sheds light on these two questions.

### THE IMPACT OF THE CRISIS IN INDONESIA

We choose Indonesia as a case study for two reasons. First, its economy was worst hit in the region—a situation exacerbated by the 1997 drought and massive forest fires in Sumatra and Kalimantan. For example, at the micro level, data from the Indonesian Family Life Surveys (IFLS)<sup>22</sup> show that the proportion of

individuals living below the poverty line has nearly doubled, from 11% to 19%. This is an enormous increase – equivalent to an additional 20 million people falling below the poverty line between 1997 and 1998. Second, the best data on the crisis and analysis of its impacts are to be found for Indonesia. Appendix 11 summarizes some of the studies available for Indonesia, and Box 4.1 summarizes some of their key findings.

A general point that emerges from the Indonesian case study – and one that has been observed in other countries in the region – is that the crisis had widespread, but not universal, effects. For example, some regions within the country were hit much harder than others. Moreover, the middle-income groups were more affected than the poorest in absolute terms, but because the poor have to make more difficult choices, they may suffer more permanent effects than the middle class. But the data show that the most severely affected were a heterogeneous group – poor and nonpoor, consumers and producers,

rural and urban, and from many different areas. While a significant per cent of the chronically poor were hit hardest by the crisis, a large number of non-poor households were also significantly affected.

Several nutritional implications for public policy in the region emerge from the Indonesian case study:

- Indicators of diet diversity and micronutrient status should be considered leading or early indicators for monitoring the impact of crises on nutrition status.
- Targetting the chronically poor is not the same as targetting crisis relief. Areas with the largest drops in welfare may not be the poorest.
- While the impact of a crisis is widespread, it may not be universal – there is scope for geographic targetting of assistance.
- Public expenditures in social sectors need to be protected during crises, because households rely increasingly on public (as opposed to private) services during hard times.

#### BOX 4.1

### Impacts of the Asian Crisis in Indonesia

Diet quality and diversity have declined. Analyses from Helen Keller International (HKI) reveal that Indonesians are consuming fewer dairy and meat products.<sup>23</sup> IFLS studies show the per cent of the budget allocated to food staples increasing and the per cent going to nonstaples decreasing.<sup>22,24</sup>

In terms of micronutrient status, the HKI work shows increased child and maternal anaemia and night blindness in rural Central Java. The IFLS analysis shows an opposite pattern: declines in low haemoglobin rates, although this is the average change for all individuals over the age of one. Both the HKI and IFLS studies show declines in the per cent of children receiving vitamin A supplements prior to the survey rounds.

In terms of adult anthropometry, the HKI studies show an increased prevalence of low maternal BMI, and the IFLS study shows an increased prevalence of low BMI for all adults.

In children, the crisis did not have universal effects. Some regions were harder hit than others. For example, the HKI data from Central Java for 1995–99 show increases in wasting and underweight in children under 5. The IFLS data show declines in wasting and stunting rates for children aged 5–9. For children aged 7–12, the IFLS data show decreases in school enrollment for both boys and girls. For the same age group, the 100-Village Survey shows the reverse pattern.

The IFLS data show that households are devoting a decreasing share of their shrinking budgets to education and health care. ■

Improved safety net mechanisms are needed to mitigate the effects of future crises. For the Indonesia case study, the IFLS study reports that in the months before the 1998 survey, 9.6% of households received assistance from the government or nongovernmental organizations (NGOs) in the form of cash, food, or non-food, and 22.9% of households were able to purchase food in subsidized markets. These coverage rates are reasonably high, although they can only be evaluated in response to the location of need. But the average value of the transfer was only 1% of average monthly household expenditures.

### **Globalization of Trade: Food Quality and Safety**

The globalization of food trade refers to the process of improving access to food markets throughout the world by reducing and ultimately removing barriers to trade. During the Uruguay Round of multilateral trade negotiations, which started in 1986 and lasted eight years, the international community attempted for the first time to introduce rules regarding the liberalization of trade in agricultural products. The Marrakesh Agreement, which marked the close of the Uruguay Round negotiations, established the World Trade Organization (WTO) with the mandate to establish the global rules of trade between nations. Countries that join the WTO commit themselves to respect the series of agreements that were achieved during the Uruguay Round. To date 134 countries have joined the WTO and a further 31 countries have applied for membership.

The World Trade Organization organized a summit in Seattle in December 1999 to launch a new round of trade negotiations following up on the Uruguay Round. Efforts to launch a new round at this meeting were unsuccessful and have been suspended with a view to restarting the talks in Geneva in 2000.<sup>25</sup>

### **FOOD QUALITY, SAFETY, AND THE CONSUMER**

The value of international food trade in 1997 stood at US\$458 billion and continues to show steady growth. The high level of international trade in food is prompted by a number of factors. Consumers are demanding a greater variety of foods fitting a range of preferences and lifestyles. Likewise, the food industry is supplying more options. Foods are now produced, handled, processed, and packaged using a variety of novel techniques, and new foods are

entering the international food market. These innovations have created new challenges to food safety. Reports of new pathogens and new associations of food to pathogens have been linked to the innovations in handling, processing, and presenting foods.

### **CONSEQUENCES OF POOR QUALITY CONTROL**

The international food market is of great importance to industrialized and developing countries alike. Growth of food exports not only provides much-needed foreign exchange but also generates employment within the agricultural and agro-industrial sectors. Food exporters who fail to ensure that the quality and safety requirements of importing countries are respected can face serious economic repercussions. Detention, rejection, and destruction of food consignments have obvious negative cost implications for food exporters. It is in the economic and national interest of food-exporting countries to reliably supply safe products of acceptable quality.

Poor food safety control in international trade also has important public health implications. Food-borne illness has been linked to internationally traded food.<sup>26</sup> Diarrhoeal diseases are the second leading infectious cause of death worldwide for children under age five<sup>27</sup> and are projected to remain so until 2020 if current trends in resource allocation persist.<sup>28</sup> The large volume of food traded internationally presents a major challenge to public health authorities. Countries must develop and implement adequate food control measures to ensure that food entering and leaving the country is safe.

### **OVERVIEW OF SPS AND TBT AGREEMENTS**

Having decided to embark upon the path towards a globalized food market, governments must deal with several issues related to the regulation of the international food trade in order to protect their citizens. Consumers must be protected from food-borne hazards and fraudulent practices in the food trade. Just as important, governments must ensure the quality and safety of food supplies without introducing unnecessary barriers to trade. These issues were discussed during the Uruguay Round and are dealt with in the WTO Agreements on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) and Technical Barriers to Trade (TBT Agreement).

The SPS Agreement is intended to set rules that prevent food safety measures from being used as non-tariff barriers to trade. The agreement emphasizes the

use of risk assessment in determining the appropriate level of protection with respect to human, animal, or plant life and health in a territory and the use of scientific principles and evidence in establishing and evaluating SPS measures. It also calls for WTO members to regulate food safety based on the standards, guidelines, and recommendations set forth by the Codex Alimentarius Commission regarding food additives, veterinary drug and pesticide residues, contaminants, methods of analysis and sampling, and hygienic practice (see Box 4.2).

The TBT Agreement is designed to ensure that technical regulations and standards do not create unnecessary obstacles to trade. This agreement covers

a large number of measures that seek to protect consumers from economic fraud and deception. Codex Alimentarius provisions concerning quality and compositional requirements, labeling, and methods of analysis are relevant to the TBT Agreement.

Two critical concepts reflected throughout the agreements are harmonization and transparency. The importance of harmonization is clear. When potential trading partners apply different standards of food quality and safety, trade becomes complicated if not impossible. Transparency is essential for assuring the integrity of the agreements and building a solid foundation for a globalized food market.

#### BOX 4.2

### **Codex Alimentarius: A Mechanism for Ensuring the Quality and Safety of the World's Food Supply**

**T**he Joint FAO/WHO Food Standards Programme and the Codex Alimentarius Commission (CAC) were established in 1962 in response to worldwide recognition of the need to ensure the quality and safety of the world's food supply, given growth trends in international trade. Today there are 165 member countries in the Commission: a strong basis for achieving global consensus on issues related to food quality and safety.

The objectives of the programme are to protect the health of consumers and to ensure fair practices in food trade; to promote coordination of all food standards work undertaken by national governments and international governmental and nongovernmental organizations; to determine priorities and initiate and guide the preparation of draft standards with the aid of appropriate organizations; to finalize standards; and, after acceptance by governments, to publish them in a Codex Alimentarius (Latin for food code) as either regional or worldwide standards.

The role of Codex Alimentarius in facilitating international trade has been strengthened through the recognition given in WTO agreements to Codex standards, guidelines, and recommendations as benchmarks for quality and safety of food in international trade. The CAC's elaboration of their standards, guidelines, and recommendations reflects their rigorous use of science and scientific evidence.

In undertaking its work on the establishment of standards for foods and limits for ingredients, food additives, pesticide and veterinary drug residues, and various contaminants in food, the CAC is regularly provided with independent scientific advice from the Joint FAO/WHO Expert Committee on Food Additives, called JECFA, and the Joint FAO/WHO Meeting on Pesticide Residues. The CAC also frequently draws on the advice of other bodies, such as the International Commission on Microbiological Specifications for Food, and panels of experts that are convened on a temporary basis to address specific issues relevant to its deliberations. ■

Exporters' capacity to ensure that their products meet internationally accepted standards of quality and safety consistent with provisions of the SPS and TBT Agreements is a prerequisite to participation in the globalized market. Compliance with regulatory requirements, however, is not the only consideration. Globalization of trade means free and open competition, and food exporters must obtain the trust and confidence of importers if they are to maintain or expand market share. They can only do this through consistent assurance of their product quality and safety and careful attention to the specific demands of markets of interest to them.

To ensure food quality and safety, countries must establish appropriate food legislation and implement food control programmes to enforce compliance with legislation. The standards, guidelines, and recommendations adopted by the Codex Alimentarius provide the basis for national food regulations and controls and are recognized by the WTO Agreements as a basis for international harmonization of food quality and safety measures.

There will be trade-offs however. Exporting countries may not have the monitoring and enforcement capacity to improve food safety to importer standards. In countries such as Ghana where the poor purchase a high proportion of their food from street vendors, excessive regulation may lead to the closure of such vendors, and this could have a detrimental impact on the nutritional status of the poor.<sup>29</sup> As proposed by WHO, such regulations should address only the essential safety requirements.<sup>30</sup> On the positive side, a food regulatory system is a necessary prerequisite for the establishment of national food fortification programs, which have large nutritional benefits.

Another dimension of food trade liberalization is the decline in overall grain stocks and decrease in the availability of food aid globally. This decline may lead to greater food price volatility, particularly in thinly traded grains such as rice. Rather than arguing for more food aid *per se*, this potential volatility calls for more attention to appropriate safety net measures in countries dependent on food imports.

## The Globalization of Information and Communications

*Knowledge about how to treat such a simple ailment as diarrhea has existed for centuries but millions of children continue to die from it because their parents do not know how to save them.*

*World Development Report 1998/99, p. 1.*

The last decade has seen an unprecedented decline in the cost of transferring information. Transmitting information electronically today costs 1/100<sup>th</sup> what it did in the mid-1980s,<sup>31</sup> thanks to a revolution in information and communications technology: personal computers, microchips, optical fibres, satellite communications, and the like—that has connected hundreds of millions of people to each other and to enormous amounts of information via the Internet.<sup>32</sup> Three hundred thousand users join the Internet each week, and while access to this information is far from global, some developing countries are catching up: uptake in several developing countries is now exceeding those of some industrialized countries.

The new information technology provides several opportunities for accelerating the reduction of malnutrition. First, a vast amount of food and nutrition information and data is already available to anyone with access to the Internet. Appendix 12 provides examples from the UN system and elsewhere. Such information can be fairly easily accessed to (1) find out about new nutrition initiatives, (2) determine the latest thinking on existing nutrition problems, (3) obtain best practices, and (4) map food production and undernutrition by country and region within country.<sup>33</sup> Second, the Internet provides a forum for debate on issues that require discussion (recent examples include the NGONUT forum—see section 5.5 and Appendix 12). Third, the wide availability of information makes organization based on the centralized control of information much harder to sustain. For example, many believe that improved access to information will foster democracy and the decentralization of decision-making.<sup>34,35</sup> The nutrition community has long recognized the benefits of decentralized decision-making at the community level, as well as the importance of democracy for avoiding undernutrition.<sup>36</sup> Fourth, easier access to information makes it easier to hold institutions and other duty bearers accountable for their actions. When human deprivation becomes more visible, as does the performance of the institutions that are charged with eliminating it, the pressures to improve

performance increase. This is an important component of respect for human rights, a subject discussed in section 4.3.

Improved access to information can, however, have negative effects on efforts to eliminate malnutrition. First, because the generators of much of the new information reside primarily in industrialized countries, there is a real danger that proprietary concerns will restrict public access to that information. Second, information is frequently incorrect – either through error or by design. Misleading information – from advertising or poor training – about breastfeeding or HIV prevention, for example, could prove fatal.<sup>37</sup> Third, information generation reflects the perspective of the person generating it. If information is generated solely by people who do not experience poverty and malnutrition themselves, it will lack balance. The new information technology affords an opportunity for the poor and malnourished to have a voice in policy-making and programme design.

How can the nutrition community accentuate the potentially positive aspects of the information and communications revolution and minimize the potentially negative ones? A number of mechanisms exist. For example, public institutions can share as much nutrition data and information as possible via the Internet and other mechanisms. They can undertake quality control of that information via peer review and open and transparent debate. They can subject themselves to accountability mechanisms such as external reviews of processes and impact, and they can make the rationales for their decisions more transparent. Finally, they can serve as active partners with private organizations to ensure that private data and information resources generate positive benefits for the poor and malnourished.

## The Increasing Urbanization of Poverty and Malnutrition

Urbanization is progressing at a rapid pace. Over the period 2000–25, the rural population of the developing world is projected to increase from 2.95 billion to 3.03 billion. Over the same period the urban population of the developing world is projected to double, from 2.02 billion to 4.03 billion.<sup>38</sup> In Asia and Latin America most of the growth in population in the next 20 years will be in urban areas (see Figure 4.2). The most recent data indicate that urban areas are responsible for an increasing share of national undernutrition (see Table 4.1). This shift is important because it is unlikely that

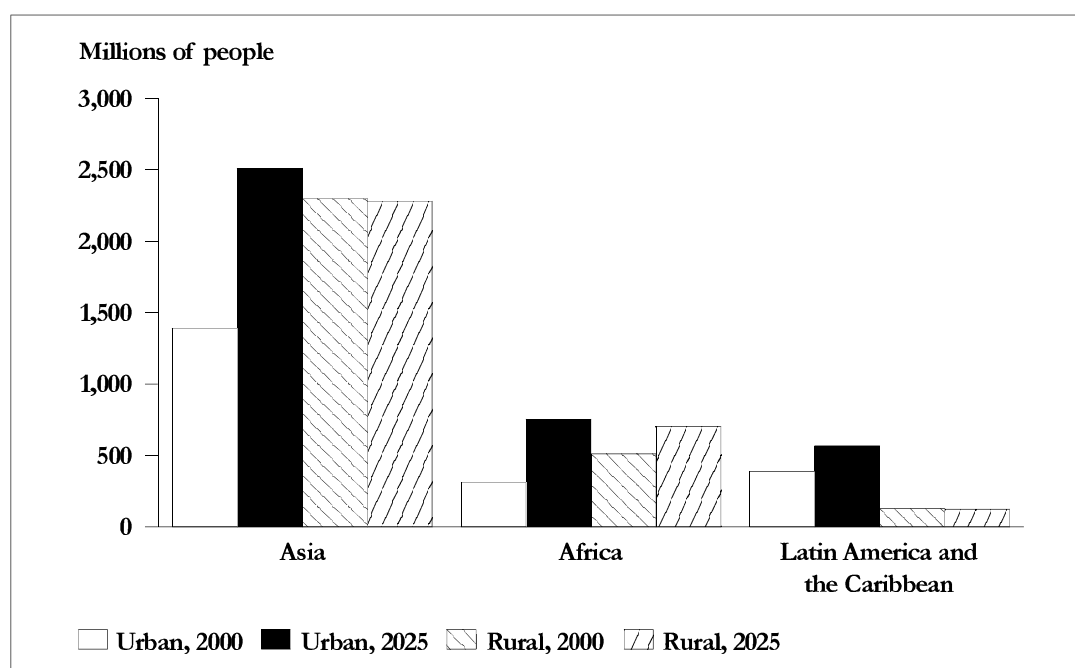
the constraints to better nutrition will be the same in urban and rural areas.

A number of phenomena that are unique to or exacerbated by urban living, and the circumstances that bring individuals to urban areas in the first place, produce these urban-rural differences. These phenomena include

1. a greater dependence on cash income for food and non-food purchases (and hence a greater reliance on foods grown by someone else),
2. possibly weaker informal safety nets (due to smaller family size and less sense of community),
3. greater participation of women in the formal labour force and its consequences for child care, in that there will tend to be fewer opportunities for women to undertake income-generating activities that are compatible with child care,
4. lifestyle changes, particularly those related to higher-fat diets and lower levels of physical activity, and given the evidence implicating foetal undernutrition as an additional risk factor for diet-related chronic disease in adults as discussed in Chapter 1, policy-makers will feel added pressure to find solutions to urban under- and overnutrition,<sup>40,41</sup>
5. greater availability of public services such as water, electricity, sewage, and health, but questionable access for poor slum dwellers, and
6. governance by a new, possibly nonexistent, set of property rights, that may deter government and NGOs from working in such communities.

These trends and phenomena pose several questions that need answering if urban malnutrition is to be effectively addressed in the next decade. First and most basic, we need better measures of trends in urban under- and overnutrition. Are the trends in Table 4.1 seen in other countries and in other time periods? Second, how different are the constraints to good nutrition in urban and rural areas, and how generalizable are those differences? Third, what are the opportunities for and challenges to developing successful programmes and policies in urban areas? For example, how does the community-based approach have to be modified in urban areas if it is very difficult to identify a cohesive community? And are governments and NGOs even willing to commit to marginal urban areas that are highly transient but highly vulnerable? Fourth, for the delivery of services to poor communities, urban malnutrition poses new problems owing to highly mobile populations. Greater distances to travel between home and work, and rising rates of violence and other crime, make outreach increasingly difficult.



**FIGURE 4.2 : Projected urban and rural population by developing-country region, 2000 and 2025**

Source: 38.

**TABLE 4.1 : Changes in the numbers of underweight children in urban areas, available countries and time periods**

	Absolute number of urban underweight children increasing	Absolute number of urban underweight children decreasing
Share of urban underweight children increasing	Bangladesh, 1985-96 China, 1992-96 Egypt, 1990-95 Honduras, 1987-93 Madagascar, 1992-95 Malawi, 1992-95 Nigeria, 1990-93 Philippines, 1987-93 Uganda, 1988-95	Brazil, 1989-96 Mauritania, 1990-96
Share of urban underweight children decreasing	Tanzania 1991-96	Bangladesh, 1989-96 Peru, 1991-96 Zambia, 1992-97

Source: 39.

## HIV/AIDS and Nutrition

Today, one in every 100 adults in the most sexually active age group (15–49) is living with HIV. The vast majority (89%) live in Sub-Saharan Africa and the developing countries of Asia. Africa alone contains 87% of all the world's children living with HIV. However, the largest increases in HIV prevalence are found in Asia.<sup>42</sup> By 2000, worldwide, the disability-adjusted life years (DALYs) attributable to diarrhoea and to HIV/AIDS will be almost identical. Nevertheless, by 2020, projections indicate that HIV/AIDS will be only the tenth leading contributor to DALYs in the developing world, behind ischaemic heart disease (first), tuberculosis (fourth), and lower respiratory infections (sixth).<sup>28</sup>

What makes this infection particularly relevant for the nutrition community? First, 90% of HIV infection in children is due to transmission of the virus from mother to child during pregnancy, delivery, or perhaps breastfeeding. Thus the nutrition community—led by WHO, UNICEF, and UNAIDS—has had to develop best practices to help educate and counsel women on how best to feed infants in the context of HIV.<sup>43</sup> Further research and thinking need to be undertaken with regard to these best practices as they evolve. In particular, how can adequate breastmilk substitutes be provided to HIV-positive mothers who choose to use them? How can provision of substitutes avoid spill-over, that is, unnecessary use by HIV-negative mothers and those of unknown status?<sup>44</sup>

Second, there is some evidence to suggest that improved nutrition may play a role in preventing the transmission and progression of the disease, although this link remains inconclusive and much more basic research is needed.<sup>43</sup> Third, there is evidence that the orphaning of children that accompanies the adult mortality due to HIV/AIDS leads to stunting of children regardless of the wealth of the adopting household—and decreases in school enrollment and attendance as children are pulled out of education as part of the household coping strategy.<sup>45</sup> Finally, there is clear evidence that the nutrition situation in a significant proportion of Sub-Saharan Africa—the region hardest hit by HIV/AIDS—is deteriorating (see Chapter 1). The challenge to the nutrition community is to work with local organizations to identify mechanisms that enable households to cope with HIV/AIDS while maintaining investments in nutrition and education.

## 4.3 The Ascent of Human Rights in Development

Development has to do with people, but the precise role of people in development has been debated in philosophy and social and political science for several hundred years. After World War II, with the establishment of the United Nations and the adoption of the UN Human Rights Declaration, the idea that the main objective of development should be human well-being became more acceptable.

According to both capitalist and socialist perspectives, the key to such development was thought to be essentially faster economic growth, with the assumption that the economic growth would automatically result in human development in the short run. There is now a consensus that, although economic growth is crucial for sustainable improvements in human welfare, it is not a sufficient condition. Moreover, there is agreement that development is not solely economic growth or human development—it is both.<sup>37</sup> One objective is not a simple function of the other. The two are related in a complex manner.

Human development expresses itself in human capabilities. In the 1996 *Human Development Report*, UNDP defines the three most important human capabilities as (1) the capability to be well nourished and healthy, (2) the capability for healthy reproduction, and (3) the capability to be educated and knowledgeable.<sup>46</sup> In a broader sense human development can be seen as enlarging people's choices (see Box 4.3).

The failure of economic growth approaches on their own to build human capabilities has opened the door for more normative arguments in development. The number of global conferences, including the International Conference on Nutrition (1992), reflects such a normative basis. In all of these conferences goals were agreed upon. These goals were not primarily based on traditional economic arguments, but rather on normative arguments. They thus represented global moral minima—that entailed commitments or promises but not obligations.

The United Nations has a normative foundation, explicitly expressed in both the UN Charter and the Universal Declaration of Human Rights. This fact, however, was not appreciated by many development scholars and practitioners, not even within the UN itself. With the end of the Cold War and the criticism of economic growth theories, a human rights approach to development could be revived as a part of UN reform, which started in 1997.

## BOX 4.3

## New Approaches to Measuring Poverty and Development

**T**here are a number of approaches to defining and measuring poverty. The traditional model is based on assessing household income or total consumption in relation to a poverty line, which in turn is related to the ability to purchase a basket of foods that meets a given energy consumption level. More recent approaches assess poverty in a social deprivation context—a formulation closely related to the concept of human rights. The social deprivation approach takes at least three forms: (1) a human poverty approach, (2) a social exclusion approach, and (3) a participatory approach. UNDP's human poverty approach argues that "because income is not the sum total of human lives, a lack of it cannot be the sum total of human deprivation" (p. 25).<sup>37</sup> The human poverty approach focuses on a lack of access to education, income, and longevity. It is closely related to the social exclusion and participatory approaches. The social exclusion approach focuses on the lack of resources required to participate in activities and enjoy living standards that are customary or widely accepted in a society. The participatory approach looks for local definitions and perceptions of poverty and often serves to broaden the

social exclusion approach by identifying exclusion concepts that have evolved in the community in question.<sup>47</sup>

Broader definitions and measures of poverty have also become common currency in the World Bank over the past decade. Nevertheless, indicators of income poverty remain dominant in poverty assessments, and until recently the focus of country assistance strategies was still squarely on improving economic growth rates and per capita incomes. A recent assessment of World Bank performance in support of poverty reduction commits the bank to the set of targets embodied in the International Development Goals, developed in partnership with developing countries, the Organization for Economic Cooperation and Development, and UN agencies.<sup>35</sup> One indicator for the goal of reducing extreme poverty by half is preschool underweight. Improving nutritional status is of course also an important factor in achieving some of the other goals, such as reducing infant and child mortality. Although there are issues regarding the interpretation and application of the IDGs, the broad consensus around these goals and indicators is significant and creates an opportunity to ensure greater attention to nutrition in poverty assessments and strategies. ■

The subject of nutrition as a human right has been debated for years. At least in the case of children, adequate nutrition is enshrined as a human right in the Convention on the Rights of the Child, a convention ratified by all countries in the world except Somalia and the United States. The principle of the "best interest of the child" ensures that adequate nutrition is one of the rights of the child.

Human rights express relationships between subjects with claims or rights and objects with

duties or obligations. Essentially, human rights are the relationships between claim-holders and duty-bearers.<sup>48</sup> Bearers have a duty to respect, protect, facilitate, and fulfill the rights of the claim-holders. Claimants have valid claims. Bearers and claimants can be the international community, national and local governments, NGOs, communities, families, households, and parents.

For countries that have ratified human rights covenants and conventions, the issue is no longer one of

**TABLE 4.2 : Breastfeeding rights: Duties and obligations at different levels of society**

Duty or obligation	Household	Community	Government
Respect	To understand that breastfeeding is best for both boys and girls	To assist in the promotion of breastfeeding	To constantly promote breastfeeding
Protect	To avoid buying breast-milk substitutes	To inform people about the importance of breastfeeding	To protect people against misinformation
Facilitate	To assist in household work during lactation	To assist in reducing the workload of lactating mothers	To provide basic mother and child health care
Fulfill	To ensure that the lactating mother eats well and gets sufficient rest	To provide food to poor households with lactating mothers	To ensure household food security

Source: 49.

promises, but of legal obligations. UN programmes and projects should therefore aim at building and strengthening the capacity of governments and other duty-bearers to meet their obligations. Seen from this perspective, there is no conflict between human rights and development. A human rights approach represents a normative approach to development.

One of the most significant paradigm shifts embodied in a human rights approach is that people who are poor are no longer seen as passive recipients of transfers, but rather as subjects of their own actions. An important purpose of development cooperation is then to improve the capabilities, including responsibility, motivation, authority, and resources, of the duty-bearer to meet nutrition-related obligations. The next major challenge for the nutrition community is to operationalize the use of rights-based principles as a guide to nutrition programming. The 1999 ACC/SCN symposium on human rights and nutrition made progress in this regard.<sup>48</sup> Several examples of the value of rights-based approaches to nutrition programming were presented at that meeting, one of which related to breastfeeding is reproduced in Table 4.2.

## Summary

A new wave of evidence confirms the importance of nutrition to development. In particular, recent evidence shows strong links between infant undernutrition and cognitive development. This new evidence re-emphasizes the crucial role played by nutrition in the acceleration of development, no matter how it is defined. The link between foetal undernutrition and adult

chronic disease has implications for development policy, including strengthening the economic productivity rationale for investing in nutrition. The community-based approach by the nutrition community serves as a model for other sectors to emulate, re-affirming the importance of community empowerment to the overall development process.

The broad changes taking place on the global stage also have implications for the nutrition community. The freer flow of finances, food, and information presents opportunities and challenges to the nutrition community. For example, the East Asian financial crisis of 1997 and 1998 threatens to eradicate the gains in nutrition status made by a large proportion of an entire generation. The increased liberalization of food trade requires the establishment of a benchmark set of food standards. Such benchmarks exist in the Codex Alimentarius and associated agreements, which might become blueprints for effective international regulation in a global environment. Although access to information and knowledge is uneven, their scope for accelerating declines in malnutrition seems very large indeed. The rapid rate of urbanization poses new challenges to the food and nutrition community and will require new models and approaches.

Finally, the human rights paradigm has emerged as a potentially powerful way of thinking about and practicing development. Nutrition is about much more than economic productivity arguments; it is about fundamental rights. A final challenge for all the readers of this document will be to work out and to share with others ways in which the potential of the human rights paradigm can be further unleashed to enhance every available resource in the fight against malnutrition.

# 5 NUTRITION OF REFUGEES AND DISPLACED POPULATIONS

**N**utritional data on refugees and internally displaced people (IDPs) are rarely included in national survey data. The data on trends and prevalences of malnutrition described elsewhere in this report do not include refugee and displaced populations. Much of the information presented here is based on the ACC/SCN's *Reports on the Nutritional Situation of Refugees and Displaced Populations (RNIS)*.<sup>1</sup>

Unlike stable situations, displacement emergencies result in large variations in levels of undernutrition in relatively small areas. Thus, data that are aggregated by region or country can easily mask pockets of undernutrition that require an immediate, but carefully targeted, response. For example, the recent situation in Angola, where rebel forces have besieged several cities, has resulted in extremely high levels of wasting within these cities, which contrasts starkly with the more stable situation in the countryside, which is less affected by conflict. Thus, it is not appropriate to generalize about trends in the nutritional situation of refugees and IDPs either regionally or globally.

Instead of describing trends in the nutritional situation of refugees and IDPs, this chapter will provide an overview of the trends and developments in humanitarian response to the nutritional situation of refugees and displaced populations, followed by an overview of the prevalence and severity of undernutrition in recent selected emergencies in the form of six case studies. The chapter will conclude by identifying emerging issues as well as key research priorities and policy implications.

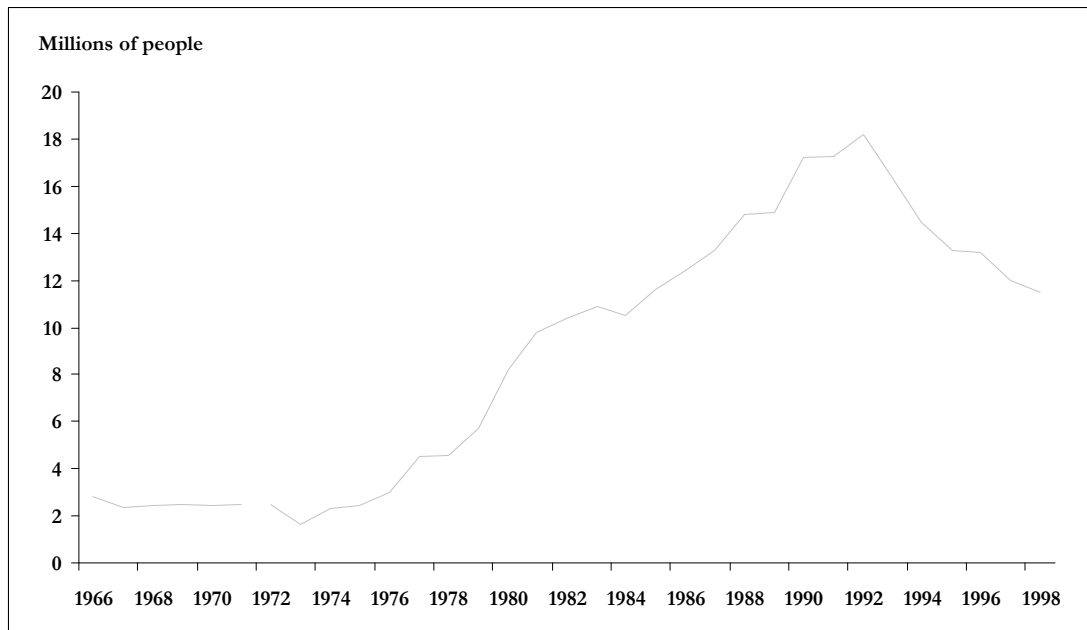
## 5.1 Trends in Numbers of People Affected

At the end of 1998 there were 21.5 million people of concern to the Office of the United Nations High

Commissioner for Refugees (UNHCR), including refugees, IDPs, and returnees.<sup>2</sup> The number of refugees was estimated to be approximately 12 million, the majority of whom were in Africa and Asia. The total number of refugees worldwide has decreased since 1992. Between 1997 and 1999 there were relatively large decreases in the numbers of refugees in Africa (due to repatriation programmes to countries such as Liberia) and Europe (repatriation to the former Yugoslavia, for example Bosnia). A small decrease has also occurred in Asia, where some of the refugees in Pakistan continue to return to Afghanistan. Figure 5.1 illustrates the trend in the numbers of refugees (both assisted and unassisted) over the past 32 years, based on data provided by UNHCR.<sup>2</sup>

The term IDP is loose and ill defined,<sup>3</sup> and it is difficult to estimate the global number of IDPs. Government denial, or incapacity to recognize a domestic IDP problem, and the lack of clear institutional responsibility for the plight of IDPs<sup>4</sup> compound the problem. Returnees may also confuse calculations and definitions (for example in Burundi), and government-organized resettlement programmes that move IDPs from insecure to safer areas temporarily or permanently (for example in Uganda) may confuse the issue further. In addition, in a country such as Somalia, which has a tradition of high population mobility, the fluidity of the situation makes estimates uncertain.

The United States Committee for Refugees (USCR) has estimated that there were more than 20 million IDPs worldwide at the end of 1998. About 8.9 million were in Africa, 5.7 million in Europe (former Yugoslavia and Turkey), and 1.3 million in South America (Colombia). It is estimated that there were more than 100,000 people displaced in 27 different countries, and more than a half million were displaced in 13 countries. In one nation, Sudan, an estimated 4 million people are currently displaced after 15 years of civil war.<sup>5</sup>

**FIGURE 5.1 : Trend in the global number of refugees, 1966 98**

Source: 20.

## 5.2 Overview of the Humanitarian Response to Emergencies

The agencies that make up the international nutrition humanitarian system are often classified under three broad headings: governmental donors, the United Nations, and nongovernmental organizations (NGOs). These organizations, although nominally independent, have a large degree of financial interdependence.<sup>6</sup>

- The governmental donors, including the European Commission (EC), supply most of the food used in emergencies and the larger part of financial resources used by international NGOs and the UN.
- Three UN agencies—the World Food Programme (WFP), UNHCR, and the United Nations Children's Fund (UNICEF)—are most directly concerned with food and nutrition in emergencies. WFP supplies bulk food commodities and blended foods.<sup>a</sup> UNHCR is chiefly involved, although not exclusively, in supplying

specialized food commodities in refugee emergencies. UNICEF supplies vitamin A and food and nonfood items for feeding programmes. In addition, the Food and Agriculture Organization of the United Nations (FAO) is increasingly taking on a more prominent role in emergency agriculture. The World Health Organization (WHO) is involved in setting nutritional norms.

- The NGOs are a disparate group, ranging from the large established organizations with technical advisory staff and sometimes permanent country representation to NGOs that are set up specifically for particular operations, like the many groups that arose to provide aid in the Balkans region.

One of the most striking features of the international relief system is the absence of formal regulation. For all practical purposes (with some exceptions, including the International Committee of the Red Cross), the component parts of the international system are free of formal regulations that oblige them to observe any minimal technical standards or, indeed, oblige them to act at all. Government donors have no formal obligation to respond to any specific emergency in another sovereign state.

<sup>a</sup> Blended foods are flours composed of precooked cereals and a protein source, mostly legumes, fortified with vitamins and minerals, such as corn soya blend and wheat soya blend.<sup>7</sup>

The UN technical organizations are not autonomous and broadly act to support the government of the affected country. The NGOs are subject to the legislation of the country in which they work.<sup>6</sup>

Where the government of an affected country is strong and undisputed, formal coordination of the international system is possible. Where there is no government or only weak government precisely the conditions under which an emergency is most likely there is no system of authority. The UN has no authority over the NGOs, and no NGO has authority over any other, making coordination of relief efforts difficult.<sup>6</sup> The need for improved coordination and coherence among the members of the international community, which is now widely recognized, is critical for planning a standardized response that takes a multi-sectoral approach to reducing risk and addressing humanitarian needs.<sup>8</sup>

Since the mid-1990s, various inter-agency initiatives have produced momentum towards greater transparency and accountability in the humanitarian system. The Code of Conduct for the International Red Cross and Red Crescent Movement and NGOs in Disaster Relief seeks to guard standards of operation for humanitarian agencies.<sup>9</sup> The Sphere project, which developed the Humanitarian Charter and Minimum Standards in Disaster Response,<sup>10</sup> aims to provide a practical framework for accountability by connecting the principles of humanitarianism to standards of service delivery.<sup>b</sup>

This effort comes at a time when there is concern that humanitarian principles are being eroded and that human rights (particularly protection) are ignored by humanitarian, state, and non-state actors.<sup>14</sup> At the same time, there have been limited efforts outside the humanitarian system to promote respect for humanitarian principles among warring parties who are not signatories to the Geneva Conventions. The Ground Rules in South Sudan have been an important element in these efforts.<sup>14</sup>

One noteworthy recent change has been the formation of the Office of the Coordinator of Humanitarian Affairs (OCHA). As a non-operational UN body, it seeks to move on from the former Department of Humanitarian Affairs (DHA) with an increased emphasis on coordination within the UN system.

Partnership agreements between organizations are critical for ensuring coordination and delineating clear operational roles and responsibilities. These include memorandums of understanding (MoUs) and Letters of Agreement between UN organizations, intergovernmental and nongovernmental organizations, and national entities. The most important MoUs used in a wide range of emergency food and nutrition programmes are listed in Box 5.1.

MoUs are essentially management tools and as such spell out in detail the policies and procedures that are jointly agreed. An MoU is more than simply a framework for implementing programmes; it provides a tool for advocacy to ensure that the agreed needs and rights of the programme beneficiaries are met.

## Categories of Displacement Emergencies

This chapter focuses on the nutritional consequences of, and humanitarian responses to, the following broad categories of emergencies<sup>c</sup>:

1. Recent displacement emergencies, such as in Angola, the Balkans, and East Timor in 1999. In these situations large numbers of refugees or IDPs have been forced to flee their homes, sometimes over a very short period of time. At the beginning of the displacement much of the population has little or no food stores and no livelihood mechanisms with which to obtain food or non-food needs. Humanitarian responses to this type of emergency include WFP's Emergency Operations (EMOPs) which provide immediate food assistance to either the whole, or a selected segment, of the population for a short period. EMOPs last for a maximum of 18 months.<sup>15</sup>
2. Protracted refugee emergencies, such as in Iran, Kenya, Liberia, Nepal, Tanzania, and Uganda. In these situations a refugee population has been unable to return to their country of origin, be integrated into the country of asylum, or be resettled in a third country for at least two years. The population may be completely or partially dependent on humanitarian assistance. The

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<sup>b</sup> For further information on Sphere, see [www.sphereproject.org](http://www.sphereproject.org) or reference 11. Linked with the recent initiatives (the Sphere project and Code of Conduct) to establish new structures and standards of humanitarian assistance is the pilot Humanitarian Assistance Ombudsman project (HAO), whose role will complement the previous codes by both enforcing the codes and facilitating their application in practice.<sup>12,13</sup>

<sup>c</sup> These categories are useful for the purpose of this chapter but are obviously not mutually exclusive, that is, recent displacement crises may also be complex emergencies.

## BOX 5.1

## MoUs of Most Importance to Emergency Food and Nutrition Programmes

UNHCR and WFP. This MoU has a long history; the first formal agreement was signed in 1988. A formal MoU was signed in 1994 and revised in 1997. The revisions represent collaboration towards effective policies and procedures. The MoU covers the following areas: UNHCR/WFP cooperation, intervention mandates, needs assessment, registration, logistics, distribution, monitoring and reporting, and coordination mechanisms.

UNHCR and WHO. A revision of the 1987 MoU between UNHCR and WHO was signed in 1997. The MoU covers the following areas: UNHCR/WHO cooperation in coordinated contingency planning, development of joint methodologies for assessing the health and nutrition situation, development of guidelines and training materials, development of applied research, and the integration of beneficiary

health care activities within national (host country) health services.

UNICEF and WFP. This MoU was signed in 1998. The MoU covers the following areas: needs assessment, monitoring, and evaluation of services in the areas of nutrition, health care, water, sanitation, child protection, and other social services. Of particular relevance to nutritional emergencies, UNICEF is responsible for providing therapeutic preparations and nonfood items related to food preparation and consumption, emergency shelter, nutrition monitoring, and selective feeding operations.

MoUs between WFP and FAO and UNHCR and FAO are currently being developed. In addition, other MoUs that concern emergency nutrition exist between NGOs and UN agencies such as Save the Children Fund (SCF), CARE, World Vision, and WFP. ■

level of dependence is determined by the level of self-reliance of the population, which is, in turn, limited by many factors, including constraints imposed on the refugees by the host government, land availability and quality, the local economy, and the ethnic and social ties between the refugee and the host populations. Humanitarian responses to these situations may, although not necessarily, include programmes with developmental aspects and are known as Protracted Relief and Recovery Operations (PRROs) by WFP.<sup>15</sup>

3. Complex emergency situations involving mainly IDPs, such as in Afghanistan, Burundi, Eritrea, Ethiopia, Rwanda, Somalia, Southern Sudan, and Uganda. These situations generally involve civil strife, the breakdown or failure of state

structures, disputed legitimacy of authority (whether government or rebel), the deliberate targeting of civilian populations by military forces, and the abuse of human rights, all or some of which lead to population displacement within a country. Humanitarian responses to these situations involve both emergency and developmental programmes, although not necessarily in a linear transition.<sup>16,17</sup>

Natural disasters are not generally associated with large-scale, long-term population displacement and are therefore not discussed in this chapter or in the RNIS reports.



BOX 5.2

## Definitions

**M**any of the definitions given in section 1.2 are also employed by nutritionists working in the field of displacement emergencies. In addition to the definitions given earlier, the following indicators are also used in this chapter:

**Crude mortality rates** are usually given as deaths/10,000/day.

**Acute undernutrition** is defined as wasting and/or presence of oedema.

**Oedema** is a key clinical sign of kwashiorkor, a severe form of protein-energy undernutrition, carrying a very high mortality risk in young children. ■

## The Cycle of Assessment, Analysis, Project Implementation, Monitoring, and Evaluation

Humanitarian response programmes should be based on a cycle of assessment, analysis, project implementation, monitoring, and evaluation. To be effective and appropriate, programmes that meet the needs of emergency-affected populations must be based on a clear understanding of the situation. Analysis of the effects of the emergency on those factors that affect nutritional status, and eventually, the impact of the programme itself is therefore critical.<sup>10</sup> This broad-based approach to addressing nutritional problems is frequently referred to as public nutrition.<sup>8</sup>

Assessment and analysis should consider the causes of undernutrition, including the available resources (human, economic, environmental, and infrastructural) and constraints that influence action (see Appendix 1). The process of assessment and analysis should lead to the development of appropriate nutrition policies and strategies, which should ideally include all relevant actions that will have a positive impact on nutrition in a socially and politically aware manner.<sup>8</sup>

Humanitarian programming in protracted emergencies raises a number of operational challenges. Short-term approaches continue to be the norm, and indeed are appropriate where contexts are changing rapidly, but a more strategic approach to

planning is required to support longer-term progress. However, the challenges of engaging where there is no state or building local capacity amid civil unrest will persist.

## 5.3 Trends in Assessment Methodologies

This section will briefly review the use of anthropometric surveys and food security assessments in displacement emergencies. Other early warning systems will also be discussed.

### Anthropometric Assessments

Anthropometric measurements of children aged 6–59 months are the most widely used indicators of the nutritional status of emergency-affected populations. The results of anthropometric surveys continue to be valued by decision-makers. This is because the anthropometric status of population groups is very sensitive to changes in access to food, health services, and caring practices and also because reliable data on anthropometric status are robust and are available in the majority of emergency contexts.

Problems in standardizing anthropometric surveys still exist (see Box 5.3) and can lead to difficulties in interpreting the results. Further problems may arise when generalized cut-offs for action (for

## BOX 5.3

## The Standardization of Nutrition Surveys

**I**n estimating the prevalence of acute undernutrition in an emergency-affected population, the prevalence among children between six months and five years (65 to 100 or 110 cm in height) is usually used as a proxy. Extensive differences in health and nutrition survey methods have been identified. For example, there are wide variations in the age of the target populations, sampling strategies, units of measurement, methods of rate calculation, and statistical analysis.<sup>18</sup> In March 1999, the *RNIS* reported the findings of 21 studies of nutritional status conducted in Northern Bahr-El-Ghazal Province of southern Sudan between April 1998 and January 1999. Most of these surveys were undertaken on or around airstrips where food distribution took place. The majority of surveys were conducted in communities residing within five km of feeding centres run by relief organizations. Only three surveys covered populations of complete *payams* (administrative units like sub-districts). Ten of the 21 surveys employed a cluster sampling strategy and had similar sample sizes. The others were either surveys of all children within a location or rapid assessment surveys with unknown or convenience sampling techniques. All but three of the surveys used Z-scores of wasting and the presence of oedema to define acute undernutrition. The others used per cent of median.

The most reliable estimates of the prevalence of undernutrition have come from well-defined and secure refugee camps where there is a reasonable level of camp organization and a designated agency with responsibility for the collection of data. The most difficult situations have been those where IDPs have been scattered over a wide area and where surveys could take place only in relatively secure zones. These safe zones may sometimes have acted as magnets for the most severely affected groups of a population; for example, the Somali

town of Baidoa was the site of the storage and distribution of massive amounts of relief food in 1992 and became known as the famine epicentre. Mortality and undernutrition rates were extremely high in this town. On the other hand, it is possible that the worst-affected communities have been in areas that have been inaccessible to those performing the surveys. In either case, it has proved difficult to extrapolate the findings of surveys on nutritional status conducted in specific locations to broader populations in conflict-affected countries.

Elements of well-standardized nutrition surveys include the use of weight-for-height/length and the presence of oedema to measure acute undernutrition, cut-offs for classifying undernutrition, and the presentation of confidence intervals. There is a range of sampling designs and methods for obtaining a representative sample. The methods employed should be clearly explained. Information on the prevalence of severe wasting and oedema should also be made available, as children suffering from these forms of undernutrition need specific care. Mid-upper-arm circumference (MUAC) measurements are recommended as a screening tool in emergencies as they are strongly associated with mortality.<sup>19</sup> However, MUAC measurements are not recommended for assessing nutritional status of children in population surveys until there is agreement on cut-off points to define acute undernutrition. Survey planners should consider including questions on feeding centre attendance by persons identified as undernourished (by age group) as well as reasons for non-attendance. These data are useful for programme managers. In addition, crude mortality rate (CMR) data collected in conjunction with anthropometric data are useful in assessing appropriate future responses to a situation. ■

example, a prevalence of more than 10% wasting and/or oedema) are employed in different settings, because appropriate local action must be based on more than just a single indicator. The relationship between mortality, morbidity, and nutritional status differs in different settings. In other words, the risk of dying associated with acute undernutrition varies according to the local patterns of disease; it is also likely to vary according to age. More research is needed in this field in order to fully explain the significance of acute undernutrition in terms of risk of dying and other aspects of physical dysfunction in different settings.<sup>20</sup>

In the past two years an increasing number of anthropometric surveys have been conducted on adult and adolescent IDP and refugee groups by Concern, Action Contre la Faim (ACF), UNHCR, and the Centers for Disease Control and Prevention (CDC). The extremely high mortality rates among adults in emergencies in Ethiopia, Liberia, Somalia, and southern Sudan initially fuelled interest in the subject, as well as a consideration of the effects of adult mortality on the rest of the household. Only very limited scientific literature is available, however, on the diagnosis and treatment of undernourished adults.<sup>21,22</sup> In addition, the associations between the anthropometric cut-offs currently employed and mortality and morbidity are not well understood, or studied, in many population groups. These problems are compounded in adolescents because the growth spurt starts at different ages depending on nutritional status, ethnicity, and possibly other environmental factors.

## **Famine Early Warning Systems and Food Security Assessments**

Systems to warn of impending food crises are not new, although approaches to famine early warning have changed and developed considerably over the 1990s. Following the famines of the mid-1980s, a wide range of organizations became involved in famine early warning,<sup>d</sup> in the hope that better information systems could help prevent future famines.

Early warning activities range from a global focus on national and international food availability, to a more localized focus on issues of access to food and food security. The Global Information and Early Warning System (GIEWS) run by the FAO from Rome monitors food supply and demand

around the world, and its aim is to warn the international aid community and participating national governments of food shortages for food aid planning.<sup>23</sup> The Famine Early Warning System (FEWS) of the U.S. Agency for International Development (USAID) publishes both regular regional bulletins and special alerts. These notices are based on vulnerability assessments that evaluate components of national and household food security in order to identify which people are food insecure, the nature of their problem, factors that could influence their food security, and possible interventions.

The regular joint FAO/WFP food and crop assessments undertaken to estimate national food aid needs, which are based on a food balance sheet, are an important part of GIEWS.<sup>24</sup> In ongoing emergency refugee operations WFP and UNHCR periodically undertake joint food assessment missions (JFAMs). These missions make recommendations on number of beneficiaries, modalities of assistance, composition of the food basket, ration size, duration of assistance, and logistical arrangements. UNHCR normally provides the JFAM with a nutritionist and, if applicable, other specialists to help assess levels of economic self-reliance.

Activities with a more localized focus include regular food security monitoring systems and/or emergency food security assessments. Indicators monitored by such systems depend on the location but generally include market prices, a variety of coping strategies and migration, and sometimes anthropometric status. These systems were developed in the late 1980s and continue in most countries in the Horn and East Africa.<sup>25</sup>

In recent years NGOs have undertaken increasing numbers of *ad hoc* food security assessments of emergencies. The best known of these is the food economy approach of the Save the Children Fund, UK (SCF). This approach was developed in 1994 to more accurately assess food aid needs and allow more effective targetting of food aid in protracted emergencies. The approach has two main objectives: to understand how people survive and how patterns of survival have changed as a result of shocks, and second, to estimate the size of the food gap and thereby estimate food aid needs.<sup>26</sup> The food economy approach has made a valuable contribution in highlighting the need for baseline data to interpret current events or food security indicators.

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<sup>d</sup>The OCHA ReliefWeb provides a list of early warning organizations, information, and related links (<http://www.notes.relief-web.int/websites>).

The Somalia Food Security Assessment Unit (FSAU) managed by WFP Somalia is a good example of combining various types of food security information systems. It uses the food economy approach to establish a baseline and monitors food security indicators and nutritional status over time to assess changes in food security. Where food security indicators cannot be monitored continuously, the FSAU relies on *ad hoc* missions, assessments, and sometimes surveys. FSAU collaborates with USAID FEWS to produce a joint newsletter, *Rainwatch*, issued every ten days during the main cropping season in Somalia. FEWS provides satellite data on rainfall estimates, cloud top temperatures, and the normalized difference vegetative index, while FSAU field monitors and other NGOs provide information collected locally on the ground.

Many NGOs contribute to the important field of assessing household food security, including SCF, ACF, Action Against Hunger (AAH), CARE, Oxfam, and Concern Worldwide.<sup>27</sup> The International Committee of the Red Cross (ICRC) has developed its own method for assessing economic security. Although these agencies have similar concepts and definitions of food security, they have developed a range of approaches to assessing food security.<sup>27</sup> This is partly because food security assessments may have different objectives, including the estimation of food aid needs, analysis of coping mechanisms, and the design of potential interventions. Thus the process of analysis and the style of the presentations vary. In all cases, however, the information is intended to help decision-makers form knowledgeable and timely decisions about the actions required to protect or improve the food security of an emergency-affected population.

Clinic admission data may also be useful as a type of early warning system and are currently used in many countries, including Burundi. These data must be carefully assessed by an experienced health worker who is aware of the country's social and political climate in conjunction with other personnel working in sectors related to nutrition, for an increase in admissions could be due either to deterioration in the population's nutritional status or to an increase in the ease of accessibility to clinics. In addition, such data may be biased by the geographical distribution of the clinics. As an early warning system and as a tool for evaluating and assessing current nutritional programmes, however, the data are useful. Clearly, the data are also useful when assessing whether or not a supplementary feeding programme

needs to be re-orientated or closed down. The coordination of clinic admission data is crucial if meaningful comparisons between the nutritional situations over time and between regions are to be made – otherwise NGOs may have different reporting formats and action criteria.

## 5.4 Trends in Food and Nutrition Response Programmes

This section reviews key developments in relation to specific strategies and types of nutrition related interventions in emergencies, including strategies to support and strengthen food security, general food distribution, supplementary feeding, therapeutic feeding, strategies to prevent micronutrient deficiencies, and to address the health and care related causes of undernutrition. The transition to self-reliance is also discussed briefly.

### Strategies to Support Food Security and Strengthen Livelihoods

Food security initiatives are elements of programmes in some protracted refugee emergencies. They help integrate refugees in the host country and returnees in their country of origin, as well as the displaced and ex-combatants. Usually concerned with agricultural activities, these initiatives are intended to restore the assets and production levels of affected communities as soon as possible. The food security initiatives are often designed from the findings of food economy and livelihood assessments.

FAO, through its Special Relief Operations Service, buys and delivers agricultural essentials such as seeds, tools, fertilizers, fishing gear, and livestock and veterinary supplies to permit immediate resumption of basic food production.<sup>23</sup> In Rwanda, for example, FAO coordinated the procurement and distribution of seeds and basic agricultural equipment, as well as seed multiplication schemes. With the war in Bosnia Herzegovina, markets and the supply system for seed, fertilizer, and insecticides experienced almost total breakdown. FAO led a major operation to provide 1,100 tonnes of winter wheat seed to farmers in the most destitute area (the former Bihac pocket) for the 1995 autumn planting.<sup>23</sup>

The WFP may complement these activities by distributing a food ration that allows the affected population to engage in these critical activities. The

distribution of a seed protection ration, to prevent people consuming their seeds, is also common, and occurred during recent agricultural cycles in Burundi (see section 5.6).

For returnees, UNHCR has developed a system of quick impact projects (QIPs), which are small-scale projects with rapid implementation. The projects are intended to address urgent reintegration needs and create suitable conditions for repatriation. QIPs include agricultural and veterinary support, fishing, transportation, education, sanitation, and income-generation projects. In Somalia (1992–94) agricultural QIPs were the largest group. QIPs are set up not only to benefit returnees, but also to help other sections of war-affected populations rebuild their communities and to assist reconciliation. UNHCR expects to hand over rehabilitation activities to other development actors such as UN agencies, NGOs, and government ministries after a limited period.<sup>28</sup>

In agro-pastoralist areas of Africa, like southern Sudan, where livestock forms the basis of livelihoods, livestock health programmes have been one of the most successful means of supporting food security, even in a complex emergency. Operation Lifeline Sudan has included a variety of other activities to support livelihood, including the provision of seeds, tools, and fishing equipment. A number of bartering schemes were attempted in which local goods could be bartered for essential items such as mosquito nets and soap.<sup>29</sup> In Afghanistan animal production suffered when veterinary services collapsed as a result of the war. FAO and other international organizations and NGOs have worked to establish community-based veterinary field units.<sup>23</sup>

For refugee crises and internally displaced populations, the most common constraints to implementing food security programmes are the political and security conditions that restrict access to land and the mobility of the affected population (for example, in Angola, Burundi, Nepal, Rwanda, Tanzania, and around Khartoum). A process of sustainable recovery requires stable government and security; otherwise, conflict will undermine any attempts at rehabilitation and reconstruction.

## General Rations

The distribution of an adequate general ration continues to be the most important humanitarian response to nutritional emergencies, both in fiscal terms and in terms of its importance in alleviating and preventing suffering and saving lives.

Over the past ten years general rations have improved.<sup>e</sup> The composition and quality of the general ration are critical to the well being of emergency-affected populations, especially where they have no other source of food. Internationally agreed guidelines and policies, developed by WFP and UNHCR with inputs from WHO and others, have helped improve planned rations.<sup>30</sup> These improvements include the following:

- The minimum planning figure (initial reference value) for energy requirements for populations entirely dependent on external food aid has increased from 1,900 to 2,100 kcal.
- Guidelines have been developed for adjusting this planning figure to suit local circumstances. Adjustments are made according to the age and gender composition of the population, their activity levels, their health, their nutritional and physiological status, the environmental temperature, and their access to additional sources of food.
- Recommended levels of fat and protein as a percentage of total energy have been established (17% and 12% respectively).
- Fortified food aid commodities, in particular salt (iodized) and vegetable oil (fortified with vitamin A), are now used routinely.
- Fortified blended food is now included in general rations for populations susceptible to micronutrient deficiency diseases.
- Provision of milled flour, rather than whole grains, is now recommended, particularly in the early stages of an emergency.

Other recent developments include the increasing use of Humanitarian Daily Rations (HDRs)<sup>f</sup> and Meals-Ready-to-Eat (MREs).<sup>g</sup> These rations were distributed in the Balkans region, but their use has not been evaluated yet.

<sup>e</sup> The general ration is the food ration given to everyone in the affected population irrespective of age and sex; that is, all receive the same quantity and type of food.<sup>28</sup>

<sup>f</sup> Humanitarian Daily Rations, developed by the U.S. Department of Defense, are specifically designed to meet the nutritional needs of civilians in humanitarian crisis. One HDR provides the average daily needs of the civilian population with about 1,900–2,200 kcal and adequate protein, fat, and micronutrients.

<sup>g</sup> Meals-Ready-to-Eat are based on American recipes and are designed to provide one meal three times a day (3,600 kcal). MREs contain fish and meat products, and there are over 25 different varieties.

## Distribution and Targeting Mechanisms

In the early 1990s the balance in WFP's activities shifted from predominantly development-related programmes to emergency programming. At the same time an increasing number of NGOs were becoming WFP operational partners in food distribution programmes. Given the paucity of good practice guidelines on general food distribution, increasing attention was paid to improving systems of distribution and developing guidelines.<sup>31</sup> The first detailed UN guidelines were published in 1997 by UNHCR.<sup>28</sup>

Agencies increasingly recognize the role of women in providing food for their families in emergencies. As a direct result of this, WFP has made policy commitments to giving women direct access to and control over food aid by targeting women directly and encouraging them to participate in designing, implementing, and monitoring food distributions.<sup>32</sup>

Attempts have also been made to increase the role of affected communities more generally in the distribution of food. Community-based distribution systems give responsibility for food distribution and targeting in part to locally elected committees. These systems have been tried in protracted refugee situations (Uganda), drought-affected communities (north-east Kenya, Tanzania), and even complex emergencies (southern Sudan), with varying degrees of success.<sup>33</sup>

Novel or alternative approaches to food distribution have been developed in many situations where the distribution of a standard food basket has proved problematic and even dangerous. Examples include complex emergencies where food aid was at risk of being misappropriated by rival factions, or following periods of prolonged displacement in harsh conditions where people lacked the wherewithal (fuel, cooking pots, cooking skills for new foods, etc.) to prepare food, or were in an extremely poor physiological state. Examples of successful approaches described in the *RNIS* include

- cooked food distribution (Somalia, 1992; Democratic Republic of Congo, 1997; Liberia, 1996)
- community kitchens, where people cook for themselves (Angola, 1999; Balkans region, 1999; Armenia, 1994; Georgia 1994)
- support of subsidized bakeries (Afghanistan, 1997–99; Balkans region, 1999)

- snow drop technology, in which a cargo plane is deployed to drop 200 g plastic packets of high-energy biscuits, which are packed in such a way that they float and circle as they fall through the air, ensuring a soft landing (East Timor, 1999)

## Supplementary Feeding

Supplementary feeding programmes are required to correct moderate wasting and to prevent moderately undernourished children from becoming severely undernourished. In contrast to general food distribution programmes, practical and technical guidelines for implementing supplementary and therapeutic feeding programmes have been in existence for more than 25 years.

An early example of supplementary feeding guidelines is the set of local guidelines developed by the Somali Ministry of Health's Refugee Health Unit in collaboration with UNHCR and NGOs in the early 1980s. Since then several practical guidelines have been produced by NGOs<sup>34,35</sup> and WHO.<sup>36</sup> More recently, WFP and UNHCR have produced their own guidelines for selective feeding programmes in emergency situations.<sup>37</sup> In contrast to earlier guidelines, these distinguish between targeted supplementary feeding programmes where assistance is provided selectively according to specified criteria of need, to some people or households but not to all, and blanket supplementary feeding programmes that target an entire group of people, such as children under three.

## Therapeutic Feeding

Recent years have seen a consolidation of existing knowledge in relation to the treatment of severely undernourished children. This should lead to significant reductions in fatality rates. The consolidation of knowledge has resulted from several related initiatives, including the development and dissemination of WHO guidelines<sup>h,38</sup> and the efforts of NGOs, including ACF, MSF, and Concern, which have developed appropriate nutritional and medical protocols and systems for their application amid the most difficult working conditions. Consequently, there have been considerable advances in the quality and effectiveness of therapeutic feeding programmes in emergencies.

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<sup>h</sup> These can be found at <http://www.who.int/nut/Manageme.pdf>. Meetings to develop training materials from these guidelines are planned for the near future.

Commercial companies have produced and marketed new milk (F100 and F75 milk<sup>i</sup>) and porridge formulas, based on the WHO guidelines and on the type I and II nutrient concept.<sup>39</sup> Recently a ready-to-use therapeutic food (RTUF) that has a nutritional component similar to F100 and can be eaten directly (without the addition of water) has been developed. This product may be useful in contaminated environments or where residential management is not possible, as it decreases the problems of bacterial contamination via unclean water.<sup>40</sup>

It is increasingly recognized that therapeutic feeding is as much a medical intervention as a nutritional intervention, given that most severely undernourished patients are also extremely sick. Greater attention is also now paid to the non-food and non-medical inputs, including clean water, sanitation, hygiene, emotional care and stimulation, and the presence of enough appropriately trained personnel.

A model to assess the risk of mortality for children treated for severe undernutrition in different centres, taking initial anthropometric status and the presence or absence of oedema into account, has recently been developed. This will be useful in assessing the effectiveness of different treatment centres.<sup>41</sup>

There remains a need to transfer knowledge concerning therapeutic feeding practices from NGO personnel to Ministry of Health (MOH) personnel. This is particularly relevant at the end of an emergency during the recovery stage, when national health capacities need to be strengthened before the NGOs phase out their operations. Demonstration centres and local training guidelines would be useful to achieve this end.

## Strategies to Prevent Micronutrient Deficiencies

In emergencies it is likely that micronutrient deficiencies, particularly iodine deficiency disorders, iron deficiency, and vitamin A deficiency, are amplified where there may be restricted access to food. Since the sporadic outbreaks of the more uncommon deficiencies in the late 1980s, including scurvy (Ethiopia), pellagra (Mozambican refugees in Malawi), and beriberi

(Bhutanese refugees in Nepal), UNHCR and WFP have implemented a number of strategies to prevent micronutrient deficiencies occurring in at-risk populations. In order of priority these include:<sup>42</sup>

- promoting the production of fresh fruit and vegetables, such as in Nepal
- providing fresh food items in the general ration, such as vegetables in the Balkans region
- adding a food to the ration that is rich in vitamins and minerals, such as fortified blended food, which is now routine practice in many refugee situations
- promoting access to sources of food rich in micronutrients, such as groundnuts as a source of niacin in a maize-based ration
- providing fortified foods in the ration, including iodized salt and vegetable oil fortified with vitamin A
- distributing a prophylactic dose of vitamin A to infants and young children every six months in refugee and displaced populations.<sup>j</sup>
- research assessing how wild indigenous foods may be used to prevent micronutrient deficiencies.<sup>43</sup> In some areas of southern Sudan wild indigenous foods may account for up to 50–60% of the energy content of the poorest households' diets. They also contain relatively high levels of micronutrients.

In the majority of refugee and IDP contexts there are major constraints to implementing some of these strategies, particularly promoting access to food through food production or other means. For this reason investments in a range of strategies are likely to be more effective than focusing on a single approach.<sup>44</sup>

Despite the strategies employed, micronutrient deficiencies persist in refugee and displaced populations. For example, in 1998 a UNHCR/CDC survey undertaken in Kenyan refugee camps indicated that high prevalences of vitamin A deficiency exist among adolescents. Another UNHCR/CDC survey in the Bhutanese refugee camps in Nepal investigated an outbreak of angular stomatitis in 1999 (see section 5.6). Over 600 cases of pellagra were confirmed in Kuito in Angola between August and November 1999 (RNIS 29).<sup>1</sup>

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<sup>i</sup>Two formula diets, F100 and F75, are used in the treatment of severely undernourished children. F-75 (315kJ/100ml) is used during the initial phase of treatment, while F-100 (420kJ/100ml) is used in the rehabilitation phase, after the appetite has returned. These formulas can be prepared from the basic ingredients: dried skimmed milk, sugar, cereal flour, oil, mineral mix, and vitamin mix. They are also commercially available as powder formulations that are mixed with water, although the commercial formula is expensive.

<sup>j</sup>The distribution of micronutrient supplements generally is a very low priority, particularly for water-soluble vitamins and minerals that must be taken on a daily basis (vitamin A is an exception to this).

## Strategies to Promote Care

Successful strategies to promote care require an understanding and analysis of how displacement and forced migration cause disruption and upheaval for families and communities and affect their ability to care for themselves and their children. Social networks may be weakened or collapse altogether, and the support mothers once relied on from family, friends, and, for example, the local health worker, may no longer be available.

Strategies to promote and support caregiving behaviours in emergencies have tended to focus on the individual caregivers and particular nutritionally vulnerable groups, including infants and young children, pregnant and lactating women, and the elderly. For example, in Eastern Europe, in Bosnia Herzegovina in the early 1990s, and more recently in the Balkans region, the promotion, protection, and support of breastfeeding was of special concern because the emergency-affected populations were considered dependent to a greater or lesser extent on breastmilk substitutes.

During the 1999 Balkans crisis, donations of breastmilk substitutes and commercial complementary foods were received and distributed through the aid operation either under the auspices of key UN agencies or directly by voluntary agencies delivering donated aid by road. As a consequence, breastmilk substitutes, bottles, and UHT milk were included in general distributions. Mother-and-baby tents, which became the foci for infant feeding interventions within the refugee camps, were also used in some instances to distribute infant foods to target groups. However, survey results indicated that among the refugees in Macedonia, 80–90% of mothers initiated breastfeeding, indicating great potential for the promotion of breastfeeding.<sup>45</sup> This potential was not effectively realized, which may have had long-term implications for infant feeding practice. In addition to their inappropriate supply, infant feeding products were almost exclusively labelled in foreign languages.

These activities were conducted in spite of various UN and NGO policies aimed at protecting breastfeeding. The International Code of Marketing of Breastmilk Substitutes and subsequent relevant World Health Assembly Resolutions are perhaps the most long established and overarching of these international agreements (see Chapter 3). Many contraventions of the Code by international agencies were documented. Infant formula was oversupplied and the extra formula was passed on by international

aid agencies to established Ministry of Health maternity units. Thus the violations were not restricted to emergency interventions.<sup>45,46</sup>

This recent experience highlights the importance of communication, training, and coordination in meeting the nutritional needs of infants during emergencies and further underlines the need for assessing normal infant feeding practice before providing breastmilk substitutes.

In selective feeding programmes, international agencies are paying more attention to supporting caregivers both through nutrition education on infant feeding practices and through more material support that will enable them to take care of themselves and their children more effectively. This includes ensuring that pregnant and lactating women have access to extra quantities of good-quality food, adequate time to rest, and appropriate health care from trained practitioners.

Emotional care and stimulation of infants and young children in selective feeding programmes, particularly therapeutic programmes, are now recognized as an essential part of their treatment and recovery.<sup>38,47,48</sup> In Kisangani, eastern Democratic Republic of Congo, more than 600 severely undernourished unaccompanied children were treated in the therapeutic feeding programme run by Concern. Apart from being severely undernourished, these children were also traumatized. There was evidence of disorientation, withdrawal, extreme grief, and other behaviours indicative of psychological stress. The absence of the families was a major constraint to providing adequate care. As a result Concern employed, trained, and supported local women who worked in shifts as caregivers, with a special emphasis on creating a secure and comfortable environment for the children. This included child-focused activities to maintain the child's physical comfort (hygiene and warmth) and conversing and motivating the children to take food and medicines provided. Another important initiative was to ensure that siblings were not separated.<sup>49</sup>

How relief programmes are organized, in terms of community consultation and active involvement in running programmes, can affect social systems, and even help to restore and rebuild both formal and informal networks of support.

## Transition to Self-Reliance

The transition to self-reliance involves strengthening livelihoods among refugee or displaced populations. The political and security context, which restricts the affected population's mobility and access to land, is the



most common constraint. The process of transition requires several conditions: some degree of political stability and security, a reasonable guarantee of access to necessary means of livelihood (particularly access to land and/or wage labour opportunities), and an acceptable level of legitimacy of the controlling political authority of the refugee or displaced population.

To assess possibilities for transition, information is required about needs, livelihood strategies, the nature of the relationship between host and displaced populations, and the external operating environment that is, markets and host-country government policy toward economic activities on the part of refugee or displaced populations. To obtain this kind of information, a more comprehensive kind of livelihoods assessment approach is required than the focused food aid requirements assessment methodologies can provide. This in turn may require more diversified expertise on assessment teams.

Monitoring systems must be expanded beyond inputs and outcomes. First, all the usual threats to livelihood security (like rainfall, prices) are critical in circumstances of limited potential for self-reliance. Second, changes in the external environment could rapidly reverse improvements and undermine the ability of vulnerable populations to achieve or maintain self-reliance. Third, changes in the demographic composition of the displaced population can lead to the deterioration of self-reliance strategies. Fourth, the impact and sustainability of self-reliance strategies themselves must be monitored, in terms of environmental impact, relations with the host community, and physical safety. Monitoring is critical, because these changes may require a change in programme activities to protect livelihoods or provide safety nets.

## 5.5 Trends in Information Sharing and Learning

Several recent trends in information sharing and learning between agencies that are of particular relevance to the nutrition of refugees and displaced populations are discussed in this section, including

- the coordination of activities within the nutrition sector of emergencies (including the inter-agency group on emergency nutrition);
- the coordination of information;

- the coordination and prioritization of research activities.

### Interagency Learning

During the early to mid-1990s a loose and informal network of nutritional experts from various agencies was formed. This interagency group on emergency nutrition was largely coordinated by UNHCR. The group was set up to allow opportunities for networking, sharing, and exchanging information and to move away from the concept of owning knowledge. More recently, there has been further consolidation of the food and nutrition sectors, involving information sharing and exchange through a number of key agencies, independent consultants, and academic representatives. There has been a general shift of emphasis to the factors underlying food security approaches that is broadening into a more mature public nutrition and food security outlook involving more agencies and other non-nutritionists such as economists and public health specialists.

The meetings convened by the group have contributed to improvements in applying standard procedures and protocols,<sup>k</sup> and the development of a collective process of institutional learning. Some key developments and advances in the field of nutrition in emergencies can be traced to these meetings.<sup>8</sup>

### Information Systems

The past few years have seen a significant increase in the amount of information concerning emergency nutrition from various sources available to nutritionists and the general public alike. Recent developments include

- The establishment of the Health Information Network for Advanced Planning (HINAP).<sup>1</sup> HINAP is a joint project between WHO's Department of Emergency and Humanitarian Action (EHA) and CDC. HINAP provides structured health information on communicable diseases, immunization, mortality, and nutrition organized by country. HINAP targets potential risk areas around the world for mass population movements. The information provided is

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<sup>k</sup> For example, the standard procedures for estimating the prevalence of acute malnutrition in a population, and the protocols for rehabilitation of the malnourished.<sup>48</sup>

<sup>1</sup> HINAP information is distributed at [www.hinap.org/](http://www.hinap.org/). Further information on listservers, CD-ROMS, and hard-copy bulletins will also be available shortly.

regularly updated in the event of an emergency so that programmes can be altered in light of changing circumstances. It relies on experts in the field of early warning to identify target countries and collaborates closely with other international agencies.

- The establishment of the e-mail discussion network NGONUT, which has prompted lively discussions on a range of topics, including the rehabilitation of the severely undernourished, the management of nutritional oedema, prevention and treatment of anaemia, and the assessment of nutritional status in adolescents.
- The establishment of the Emergency Nutrition Network's quarterly newsletter, *Field Exchange*, publishes articles from the field and current research and evaluation findings relevant to the emergency food and nutrition sector (see [www.tcd.ie/ENN](http://www.tcd.ie/ENN)).
- The increased dissemination of programme information by various NGOs, UN aid agencies, and bilateral organizations. During the Balkans region emergency many organizations, including, for example, WFP, ACF, and USAID, published monthly, weekly, or daily updates on the web concerning their activities in the region.

## **Applied Health and Nutrition Research in Emergencies**

Particular progress has been made in coordinating and prioritizing applied health and nutrition research needs in emergencies. During the past two years, the Department of Emergency and Humanitarian Action of WHO has led a process to formalize applied health and nutrition research to improve the quality of humanitarian interventions. WHO recently published an inventory of applied health research studies in emergency settings, which included 52 studies related to nutrition.<sup>38</sup> The same department has also published the results of a consultation called *Applied Health Research Priorities in Complex Emergencies*.<sup>50</sup>

### **5.6 Case Studies: The Scale and Severity of Nutritional Problems among Refugees and Displaced Populations**

Using examples that have been described by the *RNIS* reports in the past two years, this section illustrates

that both acute and chronic nutritional crises among refugees and displaced populations continue to occur on a regular basis. This section illustrates the wide range of prevalences of undernutrition and the underlying causes, including the basic causes linked with political instability and conflict. The response of the international community to these situations is also described. The case studies presented below have been chosen to represent different categories of emergency and highlight the effects of different operational responses on nutritional outcome.

### **Recent Displacement Emergencies: Balkans Region and Angola**

The situations in the Balkans region and Angola probably represent the two extremes of operational response to nutritional crises caused by large-scale displacement in 1999. The basic causes of the crises were similar: political instability led to violence that caused displacement. Both groups of displaced people were virtually completely dependent on food assistance during the summer of 1999, as displacement prevented farmers from harvesting their crops and others from earning a wage. Before the displacement, the conflicts had seriously disrupted food security as crops and animals were looted or burnt. Trade routes were also disrupted, and access to markets was constrained. Despite the similarities of these two crises, their impact on the nutritional status of the affected populations was very different.

At the peak of the emergency in the Balkans region, an estimated 250,000 Kosovar refugees were registered in the former Yugoslav Republic of Macedonia and 440,000 in Albania. Tens of thousands of other refugees were registered in Montenegro, and still others were evacuated out of the immediate region. Table 5.1 shows the results of four AAH nutritional surveys undertaken in the region between December 1998 and July 1999. The prevalence of wasting and/or oedema among the refugees did not increase significantly during the period of displacement (wasting is defined as  $< 2$  Z-scores and severe wasting as  $< 3$  Z-scores as opposed to per cent below median).

The Government of Angola has estimated that 900,000 people were displaced between December 1998 and September 1999 because of fighting between the government and the rebels of the National Union for the Total Independence of Angola (UNITA). Many of the displaced fled to cities in the highland provinces, where high prevalences of

**TABLE 5.1 : Prevalence of wasting and stunting among the Kosovar population *in situ* and in refugee camps between December 1998 and July 1999**

	Kosovo population, December 1998 (n = 922)		Albania camps, June 1999 (n = 906)		Macedonia camps, June 1999 (n = 859)		Kosovo population, July 1999 (n = 922)	
	Total	Severe	Total	Severe	Total	Severe	Total	Severe
Wasting <sup>a</sup> (%)	2.0	0.2	4.6	0.2	2.4	<0.1	3.1	1.0
Stunting (%)	9.4	2.1	14.6	3.0	10.4	2.6	10.7	3.0

Source: 1.

Note: Data are for children 6 to 59 months old.

<sup>a</sup> These figures include oedema.

wasting and/or oedema were recorded. No national level nutritional data are available for Angola, but the prevalences recorded in 1999 should be compared with the much lower levels recorded in these cities before the current crisis (see Table 5.2).

The humanitarian response to the Balkans emergency was effective in preventing an increase in the prevalence of wasting, stunting, and oedema among the 6- to 59-month age group. The same cannot be said for the displaced population in Angola's highland cities. Many explanations for the differences can be given. The most important of these was the huge imbalance in assistance given. An unprecedented number of agencies and institutions were involved in the humanitarian operation in the Balkans, including UN agencies, donor organizations, NATO, and up to 350 NGOs. Enormous amounts of financial and human resources were spent on this situation compared with that in other parts of the world. In contrast, the programmes in Angola were seriously underfunded. This resulted in the delivery of insufficient amounts of food and medical supplies to the affected population. Consequently the population's nutritional status deteriorated and mortality rates increased.

A further factor that contributed to the differences in the prevalence of wasting was the difference in the pre-emergency level of health and nutrition of the two populations. Many of the Angolan IDPs arrived at the highland cities in very poor condition, whereas in the Balkans nutritional screenings did not find the prevalence of wasting and/or oedema to be especially elevated on arrival at the camps. This is partially because the humanitarian community had access to the Balkan populations before the crisis which was not the case in Angola.

Other factors that played an important role in determining the level of undernutrition among the two populations after their displacement included security conditions, logistic access, and wealth redistribution. In terms of logistics, access to the Balkan population (primarily by land from ports in Montenegro and Greece) was relatively straightforward. The security conditions were stable owing to the presence of NATO troops. In addition the geographical area over which the displaced were spread was smaller. In contrast, the strategic roads around the besieged cities of Angola were cut off by UNITA for many months, and ambushes on the remaining roads were frequent. Logistical capacities

**TABLE 5.2 : Prevalence of wasting in Angola's highland cities between 1995 and 1999**

	Malange				Huambo		
	June 1997	Jan. 1999	June 1999	Sept. 1999	April 1995	Jan. 1999	May 1999
Total wasting <sup>a</sup> (%)	2.3	11.0	20.25	21.5	3.7	14.6	16.7
Severe wasting <sup>a</sup> (%)	0.4	4.5	5.7	10.5	0.1	7.3	3.5

Source: 1.

Note: Data are for children 6 to 59 months old.

<sup>a</sup> These figures include oedema.

for food assistance were dependent on the local security situation and changed very rapidly. Frequent attacks, fluctuating road tariffs, and the scarcity of fuel all led to increased costs of transport and decreased capacity. Air deliveries were also hindered by inadequate ground facilities and very high maintenance and insurance costs.

Household food security assessments have found that a large proportion of Albanian households have a family member working abroad or elsewhere in the region from whom they received remittances both before and during the crisis. In contrast, few Angolan households have a family member working abroad; moreover, resources are extremely limited for the majority of Angola's population, and thus very little wealth redistribution was possible.

Now that the majority of the Kosovar refugees have returned to their home areas, the international humanitarian community is focusing on providing assistance for their rehabilitation. Targetted food distributions coordinated by UNHCR and WFP continue via a distribution mechanism that involves a national NGO. Construction materials to provide shelter and winter seed were major priorities. The programmes are currently well funded.

The population of Angola's besieged cities, in contrast, continue to suffer. Insecurity and the presence of landmines prevent the residents from carrying out their usual farming activities. Employment opportunities have ceased as a result of the war, and food prices have soared. The army, and possibly also the IDPs, have consumed the residents' harvest reserves, and the prevalence of undernutrition is rising in this group. The government has tried to ease the problem of poor food supply by distributing land before the planting season, and various international

organizations are distributing seeds and tools. These initiatives are, however, constrained by the lack of secure farmland where UNITA forces are based near the cities and funding shortages. The nutritional outlook for the populations of Angola's highland cities is poor.

### **Protracted Refugee Emergencies: Refugees in the United Republic of Tanzania and Bhutanese Refugees in Nepal**

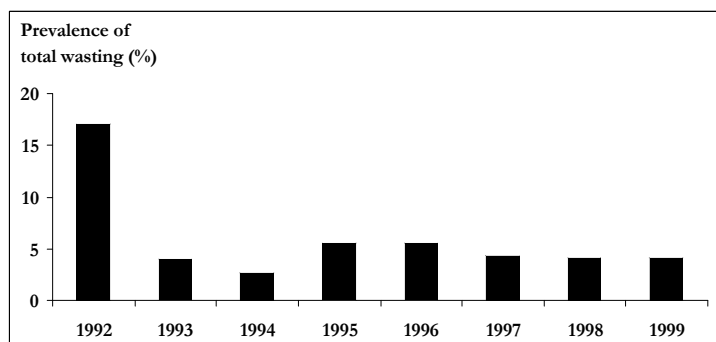
In June 1999 the United Republic of Tanzania hosted approximately 250,000 Burundian refugees who fled from ethnic and political violence in Burundi. Some of these refugees have been in Tanzania since 1993 (when Burundi's first democratically elected president was assassinated), although others have arrived more recently. At the same time, there were approximately 96,500 Bhutanese refugees registered in Nepal, most of whom fled Bhutan in the early 1990s as a result of the 'one nation, one people' policy of cultural assimilation in Bhutan.

The nutritional status of the Burundian refugees in the United Republic of Tanzania has been stable since 1995. In the Ngara camps, levels of wasting and oedema have remained below 5% since 1997, with the most recent survey results indicating a prevalence of wasting of 1.8% ( $< 2$  Z-scores) and no oedema. At the same time children in the villages surrounding the camps showed a 5.2% prevalence of wasting and/or oedema (compared with the national prevalence for Tanzania of 7.2%).<sup>51</sup>

The most recent estimate of the prevalence of wasting (defined as  $< 80\%$  median weight-for-height) among the Bhutanese children aged 6–59 months, in June 1999, was 4.1%. This low level of wasting has been maintained since 1993, the year after the majority of the refugees arrived (see Figure 5.2).

The refugees in Nepal and the United Republic of Tanzania are almost entirely dependent on external assistance for their food and non-food needs. In both countries, programmes have been well funded by donors, and hence there has been a

**FIGURE 5.2 : Prevalence of wasting in the Nepalese refugee camps**



Source: 1.

Note: Wasting is here defined as  $< 80\%$  median weight-for-height.

relatively constant food pipeline. Public health services include growth monitoring, malaria control, micronutrient supplementation, supplementary feeding programmes, and de-worming programmes. Social organization in the camps allows food distribution to be largely organized by the refugees themselves. The social organizations that have developed over the years also help implement other programmes.

While the prevalence of wasting is relatively low, the prevalence of stunting among refugees in Tanzania and Nepal is high (see Table 5.3). Given that the children measured were born in the camps, this indicates poor food security, caring practices, and health environment during their first two years in the camp.<sup>52,53</sup> However, it should be noted that national surveys in both Nepal and the United Republic of Tanzania have also found high levels of stunting.

Bhutanese refugees in Nepal have suffered from micronutrient deficiencies from a few months after their arrival, indicating a poor-quality diet. An outbreak of beriberi was identified in 1993, the cause of which was thought to be the distribution of polished rice as the main staple. A number of strategies were put in place to increase the amount of micronutrients in the diet. For example, parboiled rice, fortified blended food, and fresh vegetables were included in the general ration, along with iodized salt and vegetable oil fortified with vitamin A. These changes were accompanied by nutrition information and communication campaigns related to the washing of rice and the health benefits of parboiled rice and blended food. These combined strategies produced significant reductions in levels of micronutrient deficiencies and greater awareness on the part of the community.<sup>43</sup>

Despite these strategies a UNHCR/CDC survey in October 1999 in the Nepalese camps, which was undertaken in response to reports of an outbreak of angular stomatitis in this population, found that low riboflavin status and low serum folate status are common among adolescent refugees. Low riboflavin and serum folate are associated with angular stomatitis. The authors of the survey report suggested that the agencies involved in the health and nutrition of the refugees should increase the available dietary folate and riboflavin.

Although the programmes for the refugee populations in the United Republic of Tanzania and Nepal are long established and relatively well funded, undernutrition in terms of both stunting and micronutrient deficiencies persist. In other refugee camps, such as those in Kenya, much higher levels of wasting may be found. For example, the prevalence of wasting among children aged 6–59 months in the camps in the Dadaab area was estimated at 15% in July 1999 (RNIS 29).

### Complex Emergency Situations Involving IDPs: Bahr El Ghazal, Southern Sudan, and Burundi

The civil war in southern Sudan has been ongoing for 15 years. Bahr El Ghazal is one of the regions worst affected by conflict over this period. War strategies, on all sides, often target civilians. Regular attacks have led to loss of assets, destitution, and displacement for a large proportion of the population. Strategies for accessing food have declined over time and are constrained because of insecurity and little or no access to markets or employment. This has

**TABLE 5.3 : Prevalence of stunting among refugees and nationals in the United Republic of Tanzania and Nepal**

	United Republic of Tanzania		Nepal	
	Refugees <sup>a</sup> (6–59 months), 1999	National survey <sup>a</sup> (0–5 months), 1996	Refugees <sup>b</sup> (6–59 months), 1999	National survey <sup>b</sup> (0–36 months), 1996
Total stunting (%)	44.1	43.4	31.7	48.8
Severe stunting (%)	18.8	17.8	7.0	20.2

Sources: 1, 50.

<sup>a</sup> The definitions of total and severe stunting are based on Z-scores.

<sup>b</sup> The definitions of total and severe stunting are based on median values.

made the population more vulnerable to the regular flooding and drought in the region.

Operation Lifeline Sudan (OLS) was established in 1989, following the 1988 famine in Bahr El Ghazal, to assist war-affected civilians.<sup>29</sup> OLS is an arrangement based on an access agreement negotiated by the UN with the warring parties. It allows humanitarian assistance to be provided to civilians during conflict. A large number of agencies provide humanitarian assistance under the UN umbrella. In non-government-controlled areas, agencies and warring parties agreed that aid should be provided according to defined humanitarian principles: neutrality, impartiality, accountability, and transparency.

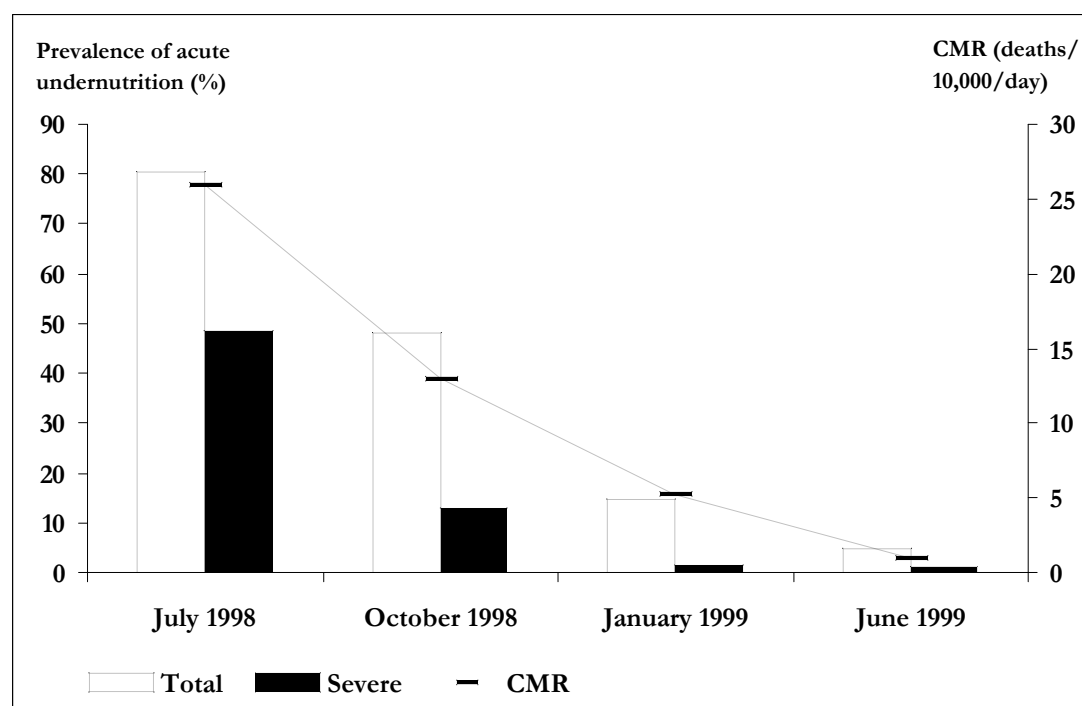
An annual needs assessment forms the basis of the annual appeal and shapes the programming of OLS. From 1994, nutritional surveillance declined in importance, and needs assessments became dominated by the food economy approach, which was introduced to more effectively target food aid. It was not until the 1998 crisis that nutritional surveys were conducted again on any significant scale.

The nutritional situation in parts of Bahr El Ghazal was catastrophic between May and August 1998. Extremely high rates of undernutrition and mortality were reported during this period. In Ajiep,

the prevalence of wasting ( $< 2$  Z-scores) and/or oedema was estimated in July at 80.3% and severe wasting ( $< 3$  Z-scores) and/or oedema at 48.5% (using a standard two-stage cluster sampling methodology). The CMR in Ajiep was estimated at 26 per 10,000 per day (see Figure 5.3). Many of those dying were adults, indicating the severity of the situation. These prevalences and rates are among the highest ever recorded in famine-affected populations. The prevalence of wasting ( $< 80\%$  median) and severe wasting ( $< 70\%$  median) and/or oedema in Tonj County between May 1995 and 1999 can be seen in Figure 5.4. In 1998, the population of Tonj County faced its most severe humanitarian crisis in ten years. A prevalence of 33.4% wasting and/or oedema, including 9.9% severe wasting and/or oedema, was estimated in May 1998.

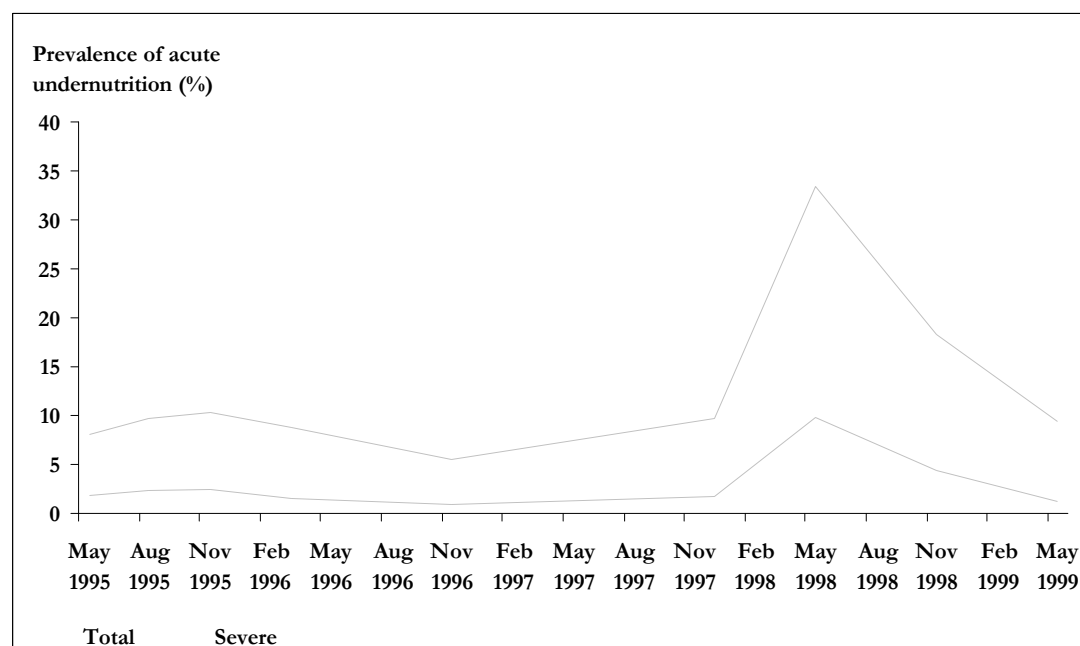
Food insecurity turned into crisis as a result of an attack on Wau (in Bahr El Ghazal), two consecutive years of drought, and population displacement throughout the region. The crisis worsened as the Government of Sudan suspended flights, including OLS humanitarian flights, over Bahr El Ghazal in February 1998, preventing the delivery of aid to the war-affected population. Even after the ban was lifted, WFP was initially unable to respond to the situation

**FIGURE 5.3 : Prevalence of acute undernutrition (wasting and/or oedema) and CMRs in Ajiep, Sudan, 1998-99**



Source: 1.

**FIGURE 5.4 : Prevalence of acute undernutrition (wasting and/or oedema) in Tonj County, Sudan, 1995-99**



Source: 1.

owing to a lack of funds. Unequal food distributions and poor coordination between the agencies assisting the population added to the problems at hand.

By November 1998, the nutritional situation in southern Sudan had improved considerably. By May 1999 the prevalence of undernutrition and the CMR were only slightly higher than before the crisis, due to better security and the lifting of the flight ban. Household food security also improved due to a harvest in some areas and a seasonal increase in the availability of wild foods, milk, and fish between September and February. In addition, increased funding for OLS and other organizations allowed increased food deliveries to the affected populations, and the humanitarian community set up numerous selective and therapeutic feeding programmes.

The most recent food security studies in Bahr El Ghazal have described the nutritional situation as fragile. Very high prevalences of undernutrition and CMRs are no longer found in most areas, although pockets do exist. Many households still require external assistance, which OLS and other organizations are currently providing when the security situation permits.

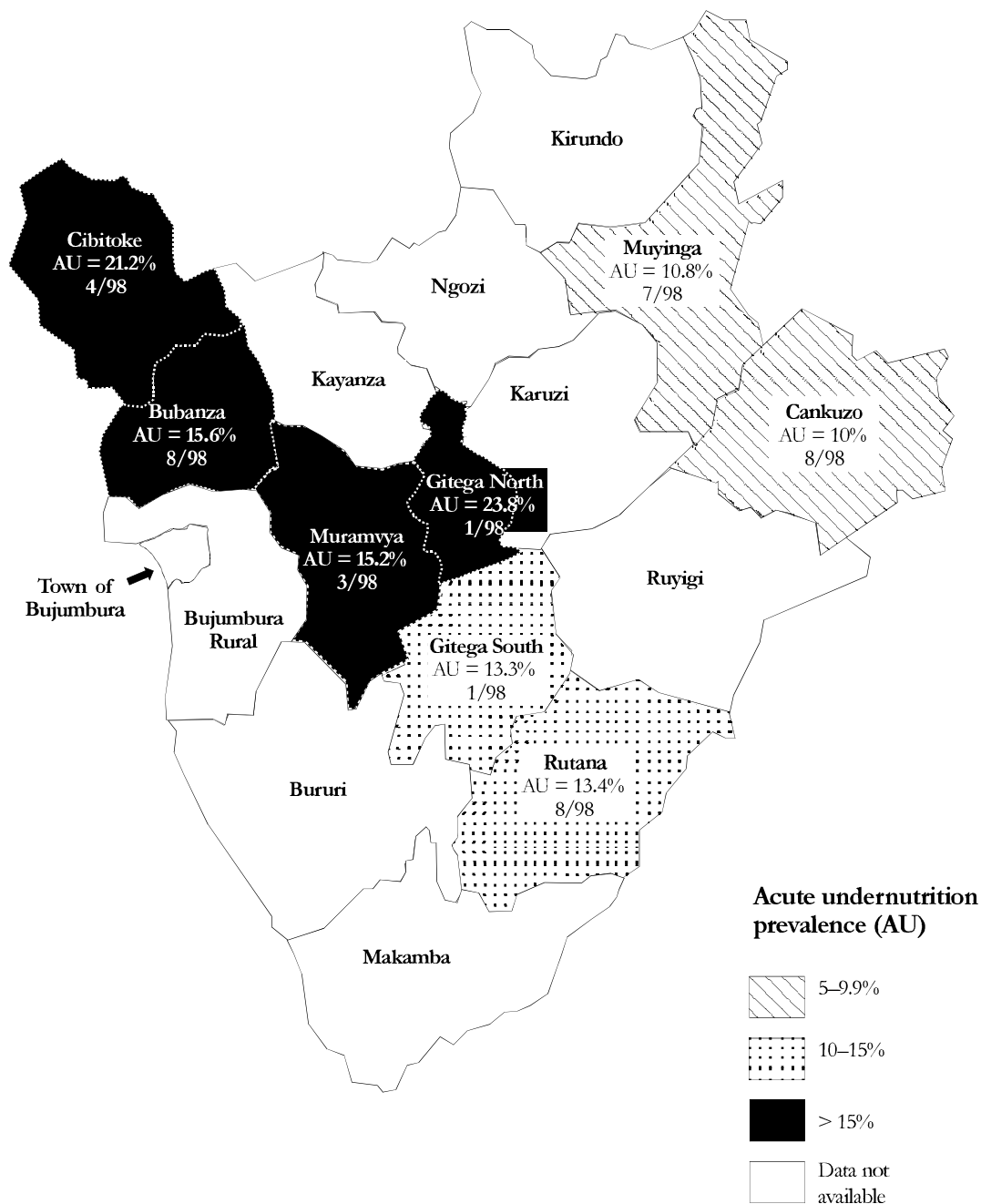
In Burundi, an estimated 600,000 people, primarily IDPs, required assistance as of mid-1999. Large numbers of people have been displaced

because of the ongoing political and ethnic violence, which has been widespread since the first democratic elections in 1993, despite the ongoing Arusha peace process.

In 1997 OCHA and the U.S. Office for Foreign Disaster Assistance (OFDA) asked UNICEF to be the lead agency in matters of nutrition in Burundi. In the second half of 1998, when the security situation had improved in much of the country, UNICEF, in consultation with the MOH, OCHA, and OFDA, designed a nutrition surveillance strategy for Burundi involving anthropometric surveys, food security assessments, and the analysis of clinic admission data in all provinces where security conditions allowed the work to be undertaken. This surveillance system was based at the provincial level in order to prevent any important inter-provincial differences being masked by a national survey. WFP and UNICEF implemented an MoU at the country level.

The results of anthropometric surveys conducted from January to August 1998 can be seen in Figure 5.5. The prevalence of wasting (< 2 Z-scores) and/or oedema varied from 23.8% in Gitega North to 10% in Cankuzo. The inter-provincial differences in the prevalence of undernutrition are due to the large variations in the security

**FIGURE 5.5 : Prevalence of acute undernutrition (wasting and/or oedema) by province in Burundi, January 1998 August 1998**



Source: 54.

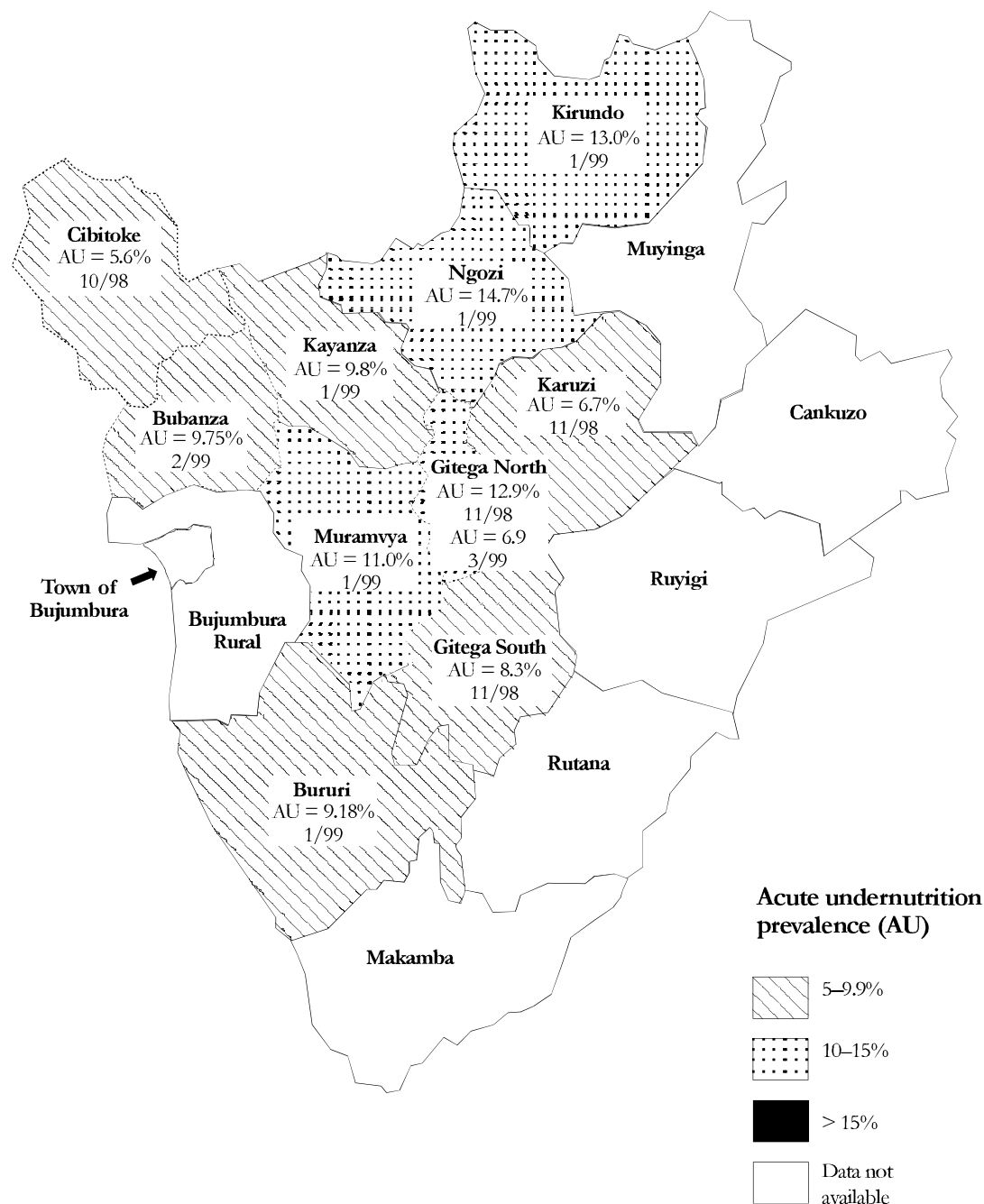
situation, access, and infrastructure throughout the country, which in turn affect food security, social and care structures, and the public health environment.

The results of further surveys conducted between September 1998 and February 1999 are shown in Figure 5.6. The prevalence of undernutrition

declined during the period between the two survey rounds: for example, the prevalence of wasting and/or oedema in Cibitoke decreased from 21.2% to 5.6% between April and October 1998. Food security surveys indicated that the major reason for this was the improvement in the security situation, which enabled



**FIGURE 5.6 : Prevalence of acute undernutrition (wasting and/or oedema) by province in Burundi, September 1998 February 1999**



Source: 54.

camps of displaced people to be dispersed and people to return to their homes after hiding in the forest. Many households were then able to resume their normal agricultural activities. Other reasons included food and seed distribution programmes by WFP and FAO, the supplementary and therapeutic feeding

programmes run by NGOs, and the increased availability of medicines for the treatment of malaria, which is a major cause of morbidity and mortality.

The examples of the 1998 famine in southern Sudan, in which an estimated 60,000 people died, and the nutritional situation in Burundi illustrate the

importance of the basic causes of undernutrition, including the wider social, economic, and political situations that affect security conditions and the distribution of resources.

## 5.7 Future Directions

### Emerging Policy Issues

There is a long and established tradition of principles of humanitarian action (notions such as humanity, impartiality, independence, and neutrality) and the broader humanitarian principles that are intended to mitigate the destructive impact of war and that must be upheld by warring parties.<sup>14</sup>

Recent years have seen a blurring of humanitarianism. There is, for example, real pressure to include conflict prevention as an explicit objective of humanitarian aid. The Nobel Peace Prize was awarded to MSF in 1999, and this step may be a mark of real change. Questions persist, however, about the extent to which this expanded humanitarianism is appropriate and the risks it poses in terms of the humanitarian-military interface.<sup>55,56</sup> Aid itself is increasingly blamed for fuelling conflict, the act of providing aid in complex emergencies is losing its aura of neutrality, and increasingly, outside agencies are considered fundamentally incapable of affecting the basic causes of humanitarian crises.<sup>14</sup>

The global availability of food for distribution as relief assistance or in support of recovery and rehabilitation has decreased considerably over the last decade.<sup>57</sup> In addition donors require evidence of greater efficiency in food aid programming. This has led to debate about the feasibility and appropriateness of focused targetting, the need for more appropriate monitoring for accountability, and evidence of positive beneficiary impact.<sup>33</sup>

Regional differences in the provision of humanitarian assistance are now obvious. The recent experience in the Balkans emergency has shown how the international humanitarian system can be successfully mobilized to prevent such emergencies from developing into acute nutritional crises. In stark contrast, however, are the complex emergencies, for example, in Angola and central Africa, where political solutions to protracted wars and internal conflict prove all too elusive and funding for humanitarian response programmes is limited, with devastating consequences for the nutrition of the civilian population.

Further complicating factors in the response to emergencies are the level of media interest that broadly determines (1) the ability of NGOs and to some extent the UN to attract funds directly from the public; (2) the level of political interest (as governments are responsive to the media) and therefore the availability of donor funds; and finally, (3) the pressure on agencies to be involved in high-profile emergencies.

### Operational and Managerial Issues

#### TRAINING AND CAPACITY BUILDING

The development of appropriate training curricula and materials to allow for wide-scale training and capacity building in nutrition assessment, planning, and programme management and evaluation (including the treatment of severe undernutrition) among international relief organizations, governments (especially those of vulnerable countries), and indigenous NGOs is required. Managers and technicians outside the nutrition sector should be included in parts of these training exercises.

#### FOOD SECURITY ASSESSMENTS

There is a need to review the strengths, weaknesses, and prognostic precision of different approaches to food security assessments and develop a consensus on the more effective methodologies and ways of working for a given set of objectives in a specific setting.

#### SECURITY

There has been an increase in the number of international humanitarian workers targetted for violent crimes. The protection of humanitarian workers presents a further operational challenge.

### Technical Issues Requiring Further Research

Donor agencies must direct more support to applied research on the assessment and response to nutritional emergencies. Current issues related to nutritional emergencies have emerged from the operational experience of relief agencies over the past 25 years, as described. Recent achievements such as the increase in applied health and nutrition research have also helped clarify the remaining technical and operational problems. Some of the issues requiring further research are outlined below. Further issues are described in RNIS 25 and the WHO report *Applied Health Research Priorities in Complex Emergencies*.<sup>50</sup>

- The assessment and management of acute undernutrition in adolescents and adults requires research. ACF is undertaking studies in Burundi looking at both body mass index (BMI) and MUAC as predictors of mortality in adults without oedema. This will help to determine thresholds to admit adults to therapeutic feeding programmes. In the meantime, BMI and MUAC values have been proposed as thresholds for screening adults when food is scarce.<sup>58</sup> Further studies are needed to develop consensus on this issue. UNHCR and CDC are currently conducting studies on adolescent undernutrition in Nepal and Kenya.
- The assessment and management of undernutrition in older people (over 50 years) presents a further challenge (see also Chapter 1). Research is needed in a wide range of areas, including appropriateness of conventional cut-offs for this population group.
- The prevention of micronutrient deficiencies in large food aid dependent populations requires more consideration. Field techniques to detect early vitamin and mineral deficiencies need to be further developed and validated. Operational research is required to assess the various strategies that are currently recommended to ensure that adequate levels of micronutrients are included in food consumed by these people.
- Reasons for the low coverage and ineffectiveness of feeding programmes, particularly supplementary feeding programmes, must be identified. Potential research topics include programme evaluation methods, reasons for poor coverage, and mechanisms to enhance performance.

## Summary

The 1990s have seen an increase in the number of both conflict- and natural disaster related humanitarian crises. The resultant humanitarian caseload and aid response has fluctuated through the decade, with a clear peak in 1994 and another likely one in 1999. The system has responded to mixed effect, while grappling with a number of complex issues.

Humaneness, or the relief of suffering, is a basic principle of all humanitarian action, which may, incorrectly, suggest rather limited interventions aimed at only providing immediate relief. Experience has shown that the most effective humanitarian actions addressing nutritional problems of refugees and displaced populations are those that are able to address both the immediate and the underlying causes of undernutrition. Examples include combined strategies that provide immediate food assistance while at the same time addressing wider public health problems and that are able to take into account the social, economic, and political determinants of undernutrition, including livelihood rebuilding. For this reason there is considerable support among the nutrition professionals of the humanitarian system for a broader problem-solving approach to assessing and responding to nutrition problems, often referred to as public nutrition, which is described at the beginning of this chapter.

For this strategy to be implemented effectively, it is crucial to raise levels of awareness and understanding among all actors in the humanitarian system, and across all sectors, about the impact of their actions on nutrition. A wide range of strategies are needed to achieve this, including developing improved multisectoral working relationships.<sup>8</sup>

## APPENDIX 1

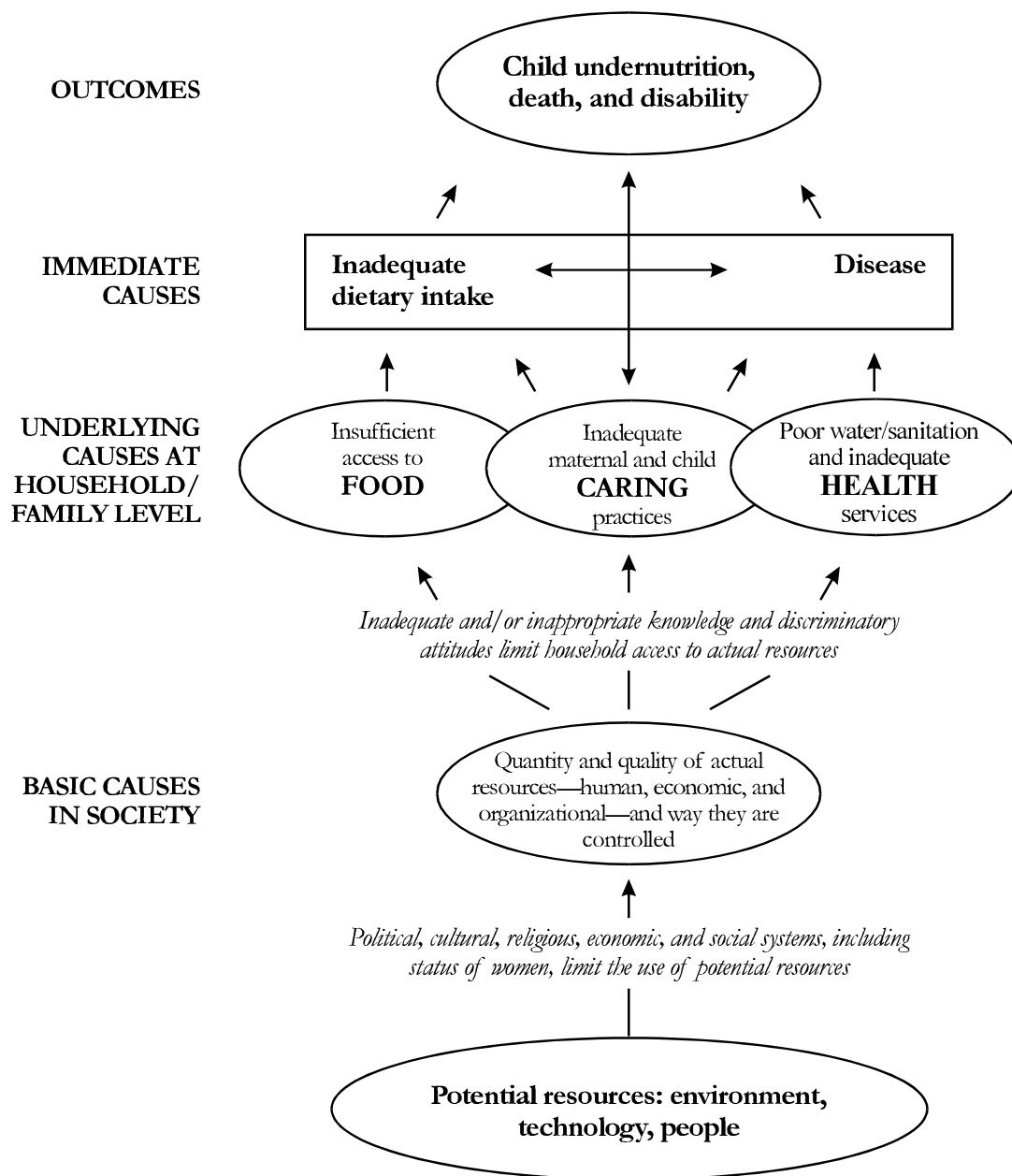
# CONCEPTUALIZING NUTRITION PROBLEMS IN SOCIETY

**T**he life cycle depicted in Figure 1.1 of Chapter 1 shows how various nutrition problems, causes, and consequences change and interact over time. To better understand what causes such problems, it is necessary to systematically consider the operation of various determinants of malnutrition at different levels in society. The food-health-care conceptual framework is a widely used analytical tool portraying causal factors and their interactions at three main levels—immediate, underlying, and basic.

The synergistic interaction between the two immediate causes—inadequate dietary intake and

disease—accounts for much of the high morbidity and mortality in developing countries. Three groups of underlying factors contribute to inadequate dietary intake and infectious disease: household food insecurity, inadequate care, and poor health services and an unhealthy environment. These underlying causes are, in turn, underpinned by basic causes that relate to the amount, control, and use of various resources. The framework is used throughout this report as an organizing principle for discussions of etiology and approaches to remedial action. Although this version of the framework pertains to child undernutrition, it can easily be adapted to other age groups and to other nutritional outcomes.

**FIGURE A1.1 : Causes of child undernutrition**



Source: Adapted from 1.

## REFERENCE

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## APPENDIX 2

# COUNTRIES IN THE UN REGIONS AND SUB-REGIONS

### AFRICA

Eastern Africa	Middle Africa	Northern Africa	Southern Africa	Western Africa
Burundi	Angola	Algeria	Botswana	Benin
Comoros	Cameroon	Egypt	Lesotho	Burkina Faso
Djibouti	Central African Republic	Libyan Arab Jamahiriya	Namibia	Cape Verde
Eritrea	Chad	Morocco	South Africa	Côte d'Ivoire
Ethiopia	Congo	Sudan	Swaziland	Gambia
Kenya	Democratic Republic of the Congo	Tunisia		Ghana
Madagascar	Equatorial Guinea	Western Sahara		Guinea
Malawi	Gabon			Guinea-Bissau
Mauritius	São Tomé and Príncipe			Liberia
Mozambique				Mali
Réunion				Mauritania
Rwanda				Niger
Seychelles				Nigeria
Somalia				St Helena (UK)
Uganda				Senegal
United Republic of Tanzania				Sierra Leone
Zambia				Togo
Zimbabwe				

### ASIA

Eastern Asia	South-Central Asia	South-Eastern Asia	Western Asia	
China	Afghanistan	Brunei Darussalam	Armenia	Syrian Arab Republic
China, Hong Kong	Bangladesh	Cambodia	Azerbaijan	Turkey
Democratic People's Republic of Korea	Bhutan	East Timor	Bahrain	United Arab Emirates
Japan	India	Indonesia	Cyprus	Yemen
Macau	Iran (Islamic Republic of)	Lao People's Democratic Republic	Gaza Strip	
Mongolia	Kazakhstan	Malaysia	Georgia	
Republic of Korea	Kyrgyzstan	Myanmar	Iraq	
	Maldives	Philippines	Israel	
	Nepal	Singapore	Jordan	
	Pakistan	Thailand	Kuwait	
	Sri Lanka	Viet Nam	Lebanon	
	Tajikistan		Oman	
	Turkmenistan		Qatar	
	Uzbekistan		Saudi Arabia	

**EUROPE**

<b>Eastern Europe</b>	<b>Northern Europe</b>	<b>Southern Europe</b>	<b>Western Europe</b>
Belarus	Channel Islands (UK)	Albania	Austria
Bulgaria	Denmark	Andorra	Belgium
Czech Republic	Estonia	Bosnia and Herzegovina	France
Hungary	Faeroe Islands (DK)	Croatia	Germany
Poland	Finland	Gibraltar (UK)	Liechtenstein
Republic of Moldova	Iceland	Greece	Luxembourg
Romania	Ireland	Holy See	Monaco
Russian Federation	Isle of Man (UK)	Italy	Netherlands
Slovakia	Latvia	Malta	Switzerland
Ukraine	Lithuania	Portugal	
	Norway	San Marino	
	Sweden	Slovenia	
	United Kingdom	Spain	
		The former Yugoslav Republic of Macedonia	
		Yugoslavia	

**LATIN AMERICA AND THE CARIBBEAN**

<b>Caribbean</b>		<b>Central America</b>	<b>South America</b>
Anguila (UK)	Jamaica	Belize	Argentina
Antigua and Barbuda	Martinique (F)	Costa Rica	Bolivia
Aruba (NE)	Montserrat (UK)	El Salvador	Brazil
Bahamas	Netherlands Antilles (NE)	Guatemala	Chile
Barbados	Puerto Rico (US)	Honduras	Colombia
British Virgin Island (UK)	St Kitts and Nevis	Mexico	Ecuador
Cayman Islands (UK)	St Lucia	Nicaragua	Falkland Islands (Malvinas) (UK)
Cuba	St Vincent and the Grenadines	Panama	French Guiana (F)
Dominica	Trinidad and Tobago		Guyana
Dominican Republic	Turks and Caicos Islands (UK)		Paraguay
Grenada	US Virgin Islands (US)		Peru
Guadeloupe (F)			Suriname
Haiti			Uruguay
			Venezuela

**NORTHERN AMERICA**

Bermuda (UK)
Canada
Greenland
St Pierre and Miquelon (F)
United States of America

## OCEANIA

Australia-New Zealand	Melanesia	Micronesia	Polynesia
Australia	Fiji	Guam (US)	American Samoa (US)
New Zealand	New Caledonia	Kiribati	Cook Islands
	Papua New Guinea	Marshall Islands	French Polynesia (F)
	Solomon Islands	Micronesia (Federated States of)	Niue
	Vanuatu	Nauru	Pitcairn (NZ)
		Northern Mariana Islands (US)	Western Samoa
		Palau	Tokelau (NZ)
			Tonga
			Tuvalu (UK)
			Wallis and Futuna Islands (F)

Source: 1.

Notes: F = overseas departments of France, French territorial collectivity; UK = UK crown dependent territory; British colony, or British protectorate; US = United States of America; = overseas territory of Portugal; = recognized by the Organization of African Unity; DK = Kingdom of Denmark; NE = Netherlands; and NZ = overseas territory of New Zealand.

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# METHODS TO ESTIMATE TRENDS IN UNDERNUTRITION PREVALENCE: A REVIEW

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In 1987 the Sub-Committee on Nutrition of the Administrative Committee on Coordination (ACC/SCN) published its *First Report on the World Nutrition Situation*.<sup>1</sup> It was a compilation of information from various United Nations agencies and presented trends over the period 1960 to 1985 for demographic and nutritional indicators in seven groups of developing countries. Its aim was to highlight current levels and recent trends in child nutritional status for different regions of the world, as part of its remit to review the evolution of global nutrition problems.

A supplement published the following year described the methodology used to derive the trends, focusing particularly on the estimation of undernutrition prevalence.<sup>2</sup> This was defined as the percentage of children below 2 standard deviations (SDs) weight-for-age using the National Center for Health Statistics/Centers for Disease Control/World Health Organization (NCHS/CDC/WHO) international growth reference. This report was made possible through the availability of information from the Fifth World Food Survey, on the one hand, and an increasing number of national anthropometry surveys on the other.

However, the number of anthropometry surveys was relatively limited at that time, and a method was devised to make the most of them. Undernutrition prevalence for particular countries was predicted from a multiple regression analysis relating prevalence to contemporary national diet and other

demographic indicators that were more widely available. Using the regression equation, the likely prevalence in a given country could then be predicted for other years, for which the indicator levels were known.

An update gave demographic and nutritional information for 33 countries,<sup>3</sup> and the *Second Report on the World Nutrition Situation* updated the results for the seven regions of the *First Report*.<sup>4</sup> Volume II of the *Second Report* described the statistical methodology used, which was broadly similar to that of the *First Report*.<sup>5</sup> A second update provided extra information for 14 countries,<sup>6</sup> and in 1996 a further update on the seven regions appeared.<sup>7</sup>

All these reports and updates used essentially the same statistical methodology to estimate undernutrition prevalence. However, this changed with the publication of the *Third Report*, in which a more direct method was used.<sup>8</sup> The change was due partly to a substantial increase in the availability of country-specific anthropometric information and partly to personnel changes in the ACC/SCN Secretariat.

The World Health Organization (WHO) prefers the more direct method of estimating trends in undernutrition prevalence, as described in the *Third Report*. In contrast, UNICEF has, since 1990, used the earlier, more indirect method to report to its Executive Board on achievement of the goals of the World Summit for Children. UNICEF has continued to use this method for the sake of consistency and without the benefit, until now, of a comparison of methods.

## Aim

The aim of this review is threefold: (1) to describe the statistical methods used by ACC/SCN to estimate undernutrition prevalence in (a) the *First* and *Second Reports* and (b) the *Third Report*; (2) to compare the two methods and make a recommendation as to which is better; and (3) to discuss the comparability of results obtained by the two methods.

## Methodology

The key ACC/SCN publications are abbreviated here as follows:

- |                                         |      |
|-----------------------------------------|------|
| • <i>First Report</i>                   | R1   |
| • <i>Supplement to the First Report</i> | R1S  |
| • <i>Second Report Volume I</i>         | R2i  |
| • <i>Second Report Volume II</i>        | R2ii |
| • <i>Third Report</i>                   | R3   |

In each case, the relevant page numbers follow, prefaced by p. For example R1S p5 indicates page 5 of the *Supplement to the First Report*.

## Data

Nutritional status is measured by three distinct indicators: weight-for-age, height-for-age, and weight-for-height. Low height-for-age, or stunting, is a marker of chronic undernutrition. Low weight-for-height, or wasting, is a sign of acute undernutrition. Low weight-for-age, or underweight, is a combination of stunting and wasting and so is a composite of acute and chronic undernutrition. For all three indicators, low is defined as a measurement below 2 SDs on the international growth reference for the child's age and sex.

The prevalences of the indicators were obtained from nationally (or for the largest countries, regionally) representative anthropometry surveys of children aged between birth and 60 months. The actual age ranges varied between surveys. The cut-off used to report underweight prevalence was sometimes 80% of the median rather than 2 SDs, and sometimes references other than those from the NCHS were used. Where necessary the resulting differences in prevalence were adjusted for (R1S p5, R2ii p94–95, R3 p94).

The *First* and *Second Reports* used underweight in preference to stunting or wasting as a marker of undernutrition on the practical grounds that it was reported more often (R1S p5). The *Third Report* switched to stunting as the indicator for three reasons (R3 p3):

the increased availability of national height data; the existence of child health goals to reduce the prevalence of stunting; and the belief that stunting is a better cumulative indicator than underweight.

Other national information was available on population, gross national product (GNP), dietary energy supply, infant and child mortality, and several other economic, food, health, and women's status indicators (R2ii p2). In many cases the data were averaged over several years and were treated as relating to the midpoint of the relevant period.

## Comparison of Statistical Methods

The statistical method used in the *First* and *Second Reports* was referred to there as an interpolation model (R1S p7). In practice it was an indirect method of estimating trends in underweight prevalence using other indicators. The method used in the *Third Report* (R3 p94–95) focused on observed trends in the prevalence of stunting and so was more direct. The terminology used here reflects this distinction: the *indirect* method of the *First* and *Second Reports* versus the *direct* method of the *Third Report*.

## Indirect Method

The underlying principle of the indirect method was that anthropometry data were sparse but data for other indicators were plentiful. Given sufficient information on the countries within a region, it was possible to relate known underweight prevalence in a particular country for a particular year to other concurrent country indicators and then to use this relationship to predict underweight prevalence in other years.

The method of prediction was multiple linear regression analysis, with underweight prevalence as the outcome measure. For the *First Report* the analyses were unweighted (R1S p7–17), while for the *Second Report* the analyses were weighted to reflect differences in the numbers of surveys per country (R2ii p98).

The *First Report*, based on data from 45 surveys in 36 countries, focused on three independent variables: dietary energy supply (KCAL), the logarithm of GNP (logGNP), and infant mortality rate (IMR). The correlations of KCAL and logGNP with underweight prevalence were high, -0.58 and -0.69, respectively. The regression model included KCAL and IMR, plus indicator (dummy) variables identifying four of the regions from which individual countries came: South Asia, Central America, South-East Asia, and South America. The regression slope between prevalence and IMR differed between South Asia

and the other regions, so an interaction term between IMR and South Asia was added. The final regression equation explained 94% of the between-country variation in underweight prevalence (R1 p49, R1S p10–11).

The regression equation was used to predict underweight prevalence for each country in the years 1975, 1980, and 1984. The prevalences by country were then weighted by the zero- to four-year-old population and aggregated to give prevalences for seven regions—the above four plus Sub-Saharan Africa, the Near East, and China (R1S p16–18).

In the *Second Report* the approach was slightly different. More data were available (100 surveys from 66 countries), and this allowed more variables to be included in the model. KCAL was the strongest individual predictor and was even better, using the value for the year prior to each nutrition survey rather than the same year (correlation = 0.49). There was still a need for an interaction term of KCAL with South Asia, as this region had a steeper regression slope with KCAL than the other regions. Three other indicators were included in the model: prevalence of female secondary education, percent of government social support, and the child population under five. Dummy variables were also included for South Asia, South America, and South-East Asia (R2ii p96). The resulting regression model explained 90% of the variation in underweight prevalence. It was used to predict prevalence by region for the years 1975, 1980, 1985, and 1990.

A third variant of the basic regression model was used by Kelly to summarize results for 82 surveys from the WHO anthropometric data bank,<sup>9</sup> and a later unpublished version of the same document extended the analysis to 153 surveys. The model included variables for dietary energy supply, infant mortality, and population density, all transformed to logarithms, two (later five) dummy variables for region, and the interaction of South Asia with logKCAL. An important difference here was the recognition of skewness in the distribution of underweight prevalence, requiring a transformation to adjust for it. In 1992 Kelly used the cube root of underweight prevalence as the outcome measure, while his later unpublished report used the logistic transformation. This is equivalent to a form of regression known as *logistic* regression, which is an analysis with some theoretical benefits compared with ordinary least squares (OLS) regression when the outcome variable is a percentage.

## Direct Method

With the increasing availability of nutrition surveys, it has become less necessary to rely on indirect estimates of undernutrition prevalence. The WHO Global Database on Child Growth and Malnutrition includes representative survey data for children ages zero to five in 103 out of 147 developing countries, a coverage of 94.5% by population.<sup>10</sup>

The commentary with the WHO global database gives trends in prevalence for different regions of the world over the period 1975–95. Previous world nutrition situation reports have estimated prevalence rates indirectly, using the regression model based on energy supply, infant mortality, and population density described above. Since 1997, a direct method has been used to obtain prevalence, based on population-weighted averages for countries with nationally representative data. The prevalences of underweight and stunting for each country with at least 75% coverage during the period were multiplied by the estimated child populations aged zero to four years in 1990 and 1995 to give the numbers of cases, and these were aggregated for each region to give regional prevalences.

This analysis has the advantage of simplicity. However, it fails to account for trends in undernutrition prevalence over time within countries, and for this some form of modelling is necessary. The data consist of repeat surveys within countries, and countries within regions. They represent three distinct sources of variation: between regions, between countries within regions, and between surveys over time within countries. Linear regression analysis is not well suited to this form of data structure as it has only one error term. Recently developed regression methods allow for more than one component of variation, here time, country, and region. The analysis goes under various names—restricted maximum likelihood (REML), random effects modelling, or multilevel modelling—but they all rely on the same principle. The multilevel model is simply an extended form of regression, with separate estimates for the three levels of variation, and the total variation is obtained by combining over the three levels.

Multilevel modelling was used for the *Third Reports* analysis, based on data for 223 surveys from 95 countries obtained from the WHO global database. The *Third Report* includes a clear and concise description of the analysis (R3 p94–95), and only a brief summary is given here. The aim was to estimate the time trend in prevalence, which would require at

least two surveys per country. Many countries had only one survey, so they could not contribute to the estimate of trend but only to the mean prevalence. For this reason it was decided to estimate a mean prevalence for each country, but to average the trends in prevalence over time across all countries, giving a set of parallel regression lines. Also, though it was possible to analyze all the regions in a single model, it would have been complex to ensure a good fit. So, instead, each region was analyzed separately, which allowed region-specific estimates for the trend in prevalence over time, and country-specific estimates for the mean prevalence. Linear, quadratic, and cubic time trends were tested for.

The fitted equations were used to predict country-specific prevalences for the years 1980, 1985, 1990, and 1995, and these were aggregated to the regional level, weighted by the relevant country populations (R3 p6). Two versions of the multilevel analysis were carried out: one with the individual survey prevalences unweighted and the other with the data weighted according to the country's population. The former analysis tests how well the data fit the model, while the latter analysis is more appropriate for assessing regional trends, with the larger countries having a greater influence on the outcome.

## Method Assumptions

The aim of fitting a model is to summarize the data using simplifying assumptions. The particular aim here is to predict prevalence by region and year. So to compare the two available methods we need to compare the validity of their assumptions.

The indirect method assumes (1) that relationships between underweight prevalence and energy supply, infant mortality, and the other indicators are linear and (2) that the slopes of the relationships are the same across all countries in all regions and are constant over time. There is one exception to this – an interaction term allows the slope of IMR

or KCAL to differ in South Asia compared with the other regions.

Another assumption concerns regional differences in prevalence. Some regions have a dummy variable fitted, while others do not. For regions with a fitted dummy variable, the prevalence predicted for the mean of their indicators is equal to the region's observed prevalence. So the prediction is unbiased. Regions without a dummy variable are treated as all one region, and their predicted prevalences for the mean levels of their indicators are, in general, not the same as their observed prevalences. So regional prevalence is well estimated if a dummy variable is fitted, and less so if not.

The direct method makes fewer assumptions. Again the aim is to predict prevalence by region and year, but now both region and year appear in the model. The multilevel model can cater simultaneously for variation between regions, countries, and years, but there are sufficient data to fit it to each region separately. Parallel regression lines of prevalence on year are fitted for each country in the region – that is, random intercepts and a common slope. So the only assumption is that all of a region's countries have the same time trend. In effect the model provides separate estimates of the mean and trend in prevalence for each region.

## Method Comparison

So, are predictions made by the two models likely to be similar? The main differences are summarized in the Table A3.1. They show that the direct model, by making fewer assumptions and estimating more effects, allows for greater regional and temporal variability in predicted prevalence. In addition, the direct model predicts time trends in prevalence directly from the time trends in the data, whereas the indirect method relies on time trends in the indicators acting as proxies for the trends in prevalence.

**TABLE A3.1 : Comparison of indirect and direct methods of predicting undernutrition prevalence, by region over time**

	Indirect model	Direct model
Separate estimates of mean regional prevalence	No <sup>a</sup>	Yes
Separate estimates of mean country prevalence within regions	No	Yes
Time trends in predicted prevalence based directly on time trends in data	No <sup>b</sup>	Yes
Separate estimates of trend in regional prevalence	No	Yes
Separate estimates of trend in country prevalence within regions	No	No

<sup>a</sup>Except for regions with dummy variable.

<sup>b</sup>Except for South Asia interaction.

Overall the two sets of predictions are likely to be most similar where there is least extrapolation—that is, where the various indicators (including time) are near the mean for the whole data set. The predictions will differ progressively as the indicator values move away from the mean, introducing variation in the slopes for the various indicators.

It would be useful to quantify the differences in prediction under the two models. The indirect model can be made more similar to the direct model by allowing the means and trends in prevalence to differ between regions. This is done by extending the indirect model to include dummy variables for each region and interactions for each region-indicator combination. For 7 regions and 2 indicators (as in the *First Report*) it would involve 6 dummy variables and 12 interactions, a total of 18 terms altogether (of which 5 were fitted in the published model). The *First Report* had insufficient data to fit the extra terms, but the more extensive *Third Report* data could easily be re-analyzed this way. The re-analysis is equivalent to applying the indirect method to each region separately, just as for the direct method. It would still leave important differences in methodology between the two approaches—indirect versus direct modelling and OLS versus multilevel regression—but the results for each region would be more directly comparable.

The introduction of the indirect method in 1987 was an imaginative way of dealing with the then shortage of anthropometry data. However, there is now a substantial body of nutritional status information covering an extended period of time, and the complex proxy nature of the indirect method cannot be justified when compared with the direct method.

## Analytic Alternatives

This review has so far focused on the differences between the indirect and direct methods. There are, however, aspects of the analyses common to both methods that deserve comment.

## Testing of Assumptions

With sufficient data, the assumptions of the two models can be tested directly. The indirect method makes many assumptions, as shown above, but most can be avoided by switching to the direct method. So it is doubly important to validate the direct method, in particular the assumption that all countries in each region have the same time trend in prevalence. This is done by fitting a random coefficients model and

seeing if it significantly improves the fit compared with the simpler random intercepts model. This was discussed in the *Third Report* (R3 p94), where Table 4 (R3 p11) compares the numbers of countries in each region showing rising and falling trends in stunting prevalence. There is clear heterogeneity in trend between the countries in each region, which indicates that a random coefficients model would provide a better fit to the data. However, this would require at least three surveys per country—two degrees of freedom for the intercept and slope, and at least one more for error—and not enough countries had more than two surveys (R3 p94).

## Linear Versus Logistic Regression

The outcome measure of interest is the prevalence of undernutrition, defined as either underweight or stunting. Prevalence is a variable taking values between 0% and 100%, and the variability in prevalence depends on its mean value. For example, prevalences near 0% or 100% are intrinsically less variable than those near 50%. The form of analysis that takes this into account is called logistic regression, which was not well developed at the time of the *First Report* but has become so since. The *First* and *Second Reports* used OLS regression, while Kelly used logistic regression latterly. The theoretical advantages of logistic regression are twofold: its weighted form of analysis stabilizes the variance, and the logit transform adjusts for skewness in the distribution of prevalence. Its one disadvantage lies in its complexity—logistic regression coefficients are in units of log odds ratios, which are hard to explain to non-statisticians. They can be converted back to mean regional prevalence figures in the same way as for linear regression, but they pose a barrier to understanding.

An alternative is to work with a simpler transformation than the logit, such as the logarithmic transformation. This adjusts for skewness but does not stabilize the variance so well. The relative advantages of the two approaches were discussed by Pelletier et al., who opted for the simpler logarithmic transformation on the grounds of transparency.<sup>11</sup>

## Choice of Method

The indirect method was an imaginative solution to a real problem, the shortage of national anthropometry surveys in the 1980s, but it is no longer relevant. As the number of surveys has risen (over 200 in the WHO global database), the case for the indirect method has evaporated. For the future estimation and prediction of trends in malnutrition prevalence,

the direct method must be the method of choice. This is a multilevel model fitted to each region separately, with random country intercepts and a common time trend. With more data, an extended model with random country trends will become feasible. To facilitate the comparison of past and future trends in prevalence, the WHO global database should be re-analyzed using the indirect method and the results compared with those for the direct method. This will show to what extent the earlier (*First and Second Reports*)

trends based on the indirect method can be compared with current and future analyses based on the direct method.

### Possible Analytic Refinements

Future analyses should, where possible, address the issues raised in the final section, particularly the testing of model assumptions and the comparison of different forms of regression analysis.

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## APPENDIX 4

# STATISTICAL NOTES FOR SECTIONS 1.1, 1.2, AND 1.3

### 1.1 : Intrauterine Growth Retardation (IUGR)

In 1998 de Onis and collaborators made the first attempt to quantify the magnitude and describe the geographical distribution of IUGR in developing countries at the global level.<sup>1</sup> They estimated the incidence of infants born at term ( $\geq 37$  weeks of gestation) with low birthweight (LBW), referred to as IUGR-LBW, using a linear regression equation proposed by Villar et al.<sup>2</sup>

$$\begin{aligned} \text{Incidence of IUGR-LBW} &= 3.2452 \\ &+ 0.8528 \text{ total rate of LBW.} \end{aligned}$$

This equation was derived from 60 populations of developing countries where gestational ages and birthweights were recorded and has an  $r$  of 0.96. The IUGR-LBW predictive equation was validated against observed values in 17 selected data sets not included in the development of the model. The equation underestimates the incidence of IUGR-LBW by a mean difference of 1.46% (95% confidence intervals of this mean difference: 2.51% to 0.40%).

The overall rate of LBW in developing countries was obtained from an updated version (September 1996) of the WHO Database on Low Birthweight.<sup>3</sup> These estimates were based on studies identified in the database as nationally representative and carried out between 1985 and 1995. Thirty-eight per cent of the selected data points were derived from monitoring systems, 17% from registration data, 13% from the Western Pacific region data bank, 10% from UNICEF field offices estimates, 9% from hospital data, 4% from government reports, 3% from community-based studies, and 6% of unknown source. Data were available for 106 out of 146 developing countries.

For the *Fourth Report* the WHO Database on Low Birthweight was reviewed in January 1999 to assess the possible effects of new data having been

added to the database since the de Onis review. Also, changes in the WHO estimates of LBW prevalence for 1979 to 1990 as set out in WHO (1992)<sup>3</sup> were examined. Both reviews indicated that LBW estimates published by de Onis et al. in 1998 are still applicable for producing estimates for the year 2000. The analysis presented in this *Fourth Report* does not include any country data points in addition to those included by de Onis et al.

### 1.2 and 1.3 : Stunting and Underweight

Multilevel modelling refers to a generalization of regression that uses multiple levels as sources of variability in the prevalence of stunting or underweight.<sup>4</sup> These levels are between regions, between countries within regions, and between surveys over time within countries. Countries that had only one survey did not contribute to the estimate of a trend but only to the mean prevalence. Mean prevalence was estimated for each country, while averages were used to estimate trends in prevalence over time across all countries. A simplified version of a random coefficient model with only random intercepts was used.<sup>5</sup> Each region and sub-region was analyzed separately. It was assumed that the availability of data for countries was not related to the prevalence of undernutrition.

To estimate the trends in the prevalence of undernutrition by region, a random coefficient model was fit for each region and sub-region with sufficient data, using the country population as sample weights. Therefore, the effect of a country was proportional to its population.

The multilevel models specified a linear (that is, straight line) relationship between prevalence of undernutrition and survey year. In other words, these models assumed that the rate of change in the prevalence is constant. To determine if any regional trends were

speeding up or slowing down, possible nonlinear relationships were examined by including quadratic and cubic polynomial terms. No evidence of nonlinear relationships was found for any region or sub-region. Thus, there was no justification in any region for fitting a curvilinear model for past or future trends.

The fitted equations were used to predict region and sub-region prevalences for the years 1980, 1985, 1990, 1995, 2000, and 2005. Uncertainty in the forecasts was assessed by 95% confidence intervals estimated by SAS Proc Mixed.<sup>6</sup> The predictions for 2010 and beyond were discarded because the 95% confidence intervals were too wide.

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## APPENDIX 5

# LATEST NATIONAL PREVALENCE OF STUNTING AND UNDERWEIGHT IN PRESCHOOL CHILDREN

Country	Year of survey	Stunting (%)	Underweight (%)
Afghanistan	1997	47.6	49.3
Algeria	1995	18.3	12.8
Argentina	1994	4.7	1.9
Armenia	1998	12.3	3.3
Australia	1995 96	0.0	0.0
Azerbaijan	1996	22.2	10.1
Bahrain	1989	9.9	7.2
Bangladesh	1996 97	54.6	56.3
Barbados	1981	7.0	5.9
Belize	1992	n/a	6.2
Benin	1996	25.0	29.2
Bhutan	1986 88	56.1	37.9
Bolivia	1998	26.8	7.6
Brazil	1996	10.5	5.7
Burkina Faso	1992 93	33.3	32.7
Burundi	1987	47.4	37.5
Cameroon	1998	29.3	22.2
Cape Verde	1994	16.2	13.5
Central African Republic	1995	28.4	23.2
Chad	1996 97	40.1	38.8
Chile	1996	2.3	0.8
China	1992	31.4	17.4
Colombia	1995	15.0	8.4
Comoros	1995 96	33.8	25.8
Congo	1987	27.5	23.9
Congo (Democratic Republic of the)	1995	45.2	34.4
Costa Rica	1996	6.1	5.1
Côte d'Ivoire	1994	24.4	23.8
Croatia	1995 96	0.8	0.6
Cuba	1993	n/a	1.5
Czech Republic	1991	1.9	1.0
Djibouti	1996	25.7	18.2
Dominican Republic	1996	10.7	5.9
Ecuador	1986	34.0	16.5
Egypt	1997 98	24.9	11.7
El Salvador	1993	23.1	11.2
Eritrea	1995 96	38.4	43.7

Country	Year of survey	Stunting (%)	Underweight (%)
Ethiopia	1992	64.2	47.7
Fiji	1993	2.7	7.9
Gambia	1996	30.1	26.2
Ghana	1993 94	25.9	27.3
Guatemala	1995	49.7	26.6
Guyana	1981	20.7	18.3
Haiti	1994 95	31.9	27.5
Honduras	1996	38.9	25.4
Hungary	1980 88	2.9	2.2
India	1992 93	51.8	53.4
Indonesia	1995	42.2	34.0
Iran, Islamic Republic of	1995	18.9	15.7
Iraq	1991	21.8	11.9
Jamaica	1993	9.6	10.2
Japan	1978 81	5.6	3.7
Jordan	1997	7.8	5.1
Kazakhstan	1995	15.8	8.3
Kenya	1994	33.6	22.5
Kiribati	1985	28.3	12.9
Kuwait	1996 97	3.2	1.7
Kyrgyzstan	1997	24.8	11.0
Lao People's Democratic Republic	1994	47.3	40.0
Lebanon	1996	12.2	3.0
Lesotho	1996	44.0	16.0
Liberia	1976	36.9	20.3
Libyan A.J.	1995	15.1	4.7
Madagascar	1997	48.3	40.0
Malawi	1995	48.3	29.9
Malaysia	1995	n/a	20.1
Maldives	1995	26.9	43.2
Mali	1995 96	30.1	40.0
Mauritania	1995 96	44.0	23.0
Mauritius	1995	9.7	14.9
Mexico	1988	22.8	14.2
Mongolia	1992	26.4	12.3
Morocco	1992	24.2	9.5
Mozambique	1997	35.9	26.1
Myanmar	1994	44.6	42.9
Namibia	1992	28.5	26.2
Nepal	1996	48.4	46.9
Nicaragua	1997 98	24.9	12.2
Niger	1998	41.1	49.6
Nigeria	1993	37.7	39.1
Oman	1995	23.0	23.3
Pakistan	1990 91	49.6	38.2
Panama	1992	9.9	6.1
Papua New Guinea	1982 83	43.2	29.9
Paraguay	1990	13.9	3.7
Peru	1996	25.8	7.8
Philippines	1993	32.7	29.6

Country	Year of survey	Stunting (%)	Underweight (%)
Qatar	1995	8.1	5.5
Romania	1991	7.8	5.7
Russian Federation	1995	12.7	3.0
Rwanda	1992	48.7	29.4
São Tomé and Príncipe	1986	25.9	16.6
Senegal	1996	22.9	22.3
Seychelles	1987 88	5.1	5.7
Sierra Leone	1990	34.7	28.7
Solomon Islands	1989	27.3	21.3
South Africa	1994 95	22.8	9.2
Sri Lanka	1993	23.8	37.7
Sudan	1992 93	34.3	33.9
Swaziland	1983 84	30.3	9.7
Syrian Arab Republic	1995	20.8	12.9
Thailand	1987	21.5	25.3
Togo	1996	21.7	25.1
Tonga	1986	1.3	n/a
Trinidad and Tobago	1987	4.8	6.7
Tunisia	1994 95	22.5	9.0
Turkey	1993	20.5	10.4
United Republic of Tanzania	1996	43.4	30.6
Uganda	1995	38.3	25.5
United States of America	1988 94	2.1	1.4
Uruguay	1992 93	9.5	4.4
Uzbekistan	1996	31.3	18.8
Vanuatu	1983	19.1	19.7
Venezuela	1997	14.9	5.1
Viet Nam	1998	35.9	39.8
Yemen	1997	51.7	46.1
Yugoslavia	1996	6.8	1.6
Zambia	1996 97	42.4	23.5
Zimbabwe	1994	21.4	15.5

Source: 1.

Note: n/a = not available.

## REFERENCE

1. WHO (2000) *Global Database on Child Growth and Malnutrition*. Geneva: WHO.

## APPENDIX 6

# EXPLAINING TRENDS IN CHILD UNDERWEIGHT IN THE DEVELOPING WORLD

**T**he causes of child undernutrition are complex, multidimensional, and interrelated, ranging from factors as fundamental as political instability and slow economic growth to those as specific in their manifestation as respiratory infection and diarrhoeal disease. This is well illustrated by the framework in Appendix 1. Determinants also differ considerably across geographical areas. Using cross-country regression analysis, it is nonetheless possible to gain a general sense of the relative importance and contribution of some broad causal factors for the developing world as a whole. A recent study undertook such an analysis using data on countries' underweight rates collected from 1970 to 1995 for children under five years of age.<sup>1</sup>

### Variables, Data, and Methods Employed

The study used the conceptual framework in Appendix 1, in which the determinants of child undernutrition are broken into three levels of causality: immediate (most proximate), underlying, and basic (the deepest level). It focused on the three underlying determinants: food security, care for mothers and children, and health environment. It also considered the roles of two basic determinants: per capita national incomes and democracy.

The dependent variable was national child underweight rates, mainly drawn from the *WHO Global Database on Child Growth and Malnutrition*. Four explanatory variables were employed to represent the underlying determinants. These were national food availability (for food security), women's education and status relative to men (for care), and access to water (for health environment). The operational measures of these variables were per capita dietary energy supplies (DES), female secondary school enrollment, a ratio of female to male

life expectancy at birth (a measure of women's status relative to men), and population with access to safe water. For the basic determinants, the operational measure of national income was gross domestic product (GDP) per capita in purchasing power parity U.S. dollars, and that for democracy was a seven-point index of political rights and civil liberties.

The analysis employed country fixed-effects multivariate regression using data from at least two points in time over the study period for 63 countries ( $n = 179$ ). This method allows estimation of the effects of any hypothesized determinant while controlling for both other factors that change over time and time-invariant country-specific factors that influence underweight. Examples of these latter variables may be agro-climatic features and entrenched social norms. Separate regression equations were specified for the underlying and basic determinants so that the magnitude of the variables' independent effects could be estimated. A series of tests was conducted to ascertain as far as possible that the relationships identified are causal rather than merely associative and that the estimated magnitudes of the effects are as accurate as possible.

### Findings

All of the determinants considered were found to have statistically significant, negative effects on underweight rates. Per capita dietary energy supplies and per capita national incomes were found to have a declining marginal effect such that as they increase the strength of their impact weakens. The effects of the basic determinants were found to occur mainly through the underlying determinants (national incomes via all four underlying determinants; democracy via health environment improvements and increased food availabilities).

**TABLE A6.1 : Contributions of various determinants to reducing the developing-country underweight rate, 1970–95**

	1995 mean	Improvement in determinant needed to reduce under- weight rate by 1 percentage point (1)	(1) as a % of developing- country range <sup>a</sup> (2)	Increase in determinant over 1970–95 as a % of range <sup>a</sup> (3)	Estimated contribution to developing- country under- weight rate (percentage points) (4)
<b>Underlying determinants</b>					
Female secondary school enrollment (%)	46.6	4.6	4.6%	31%	6.8
Per capita dietary energy supplies (kilocalories)	2,559	100	4.9%	22%	4.1
Female-to-male life expectancy ratio	1.048	.0139	9.3%	16%	1.8
Safe water access (%)	70.3	13.1	13.2%	40%	3.1
<b>Basic determinants</b>					
Per capita GDP (US\$)	2,121	74	0.89%	13.4%	7.4
Democracy (7 = most democratic)	2.7	0.8	13.1%	3.3%	+0.18

Source: 1.

<sup>a</sup> The developing-country ranges of the variables are as follows: safe water access (1–100); female secondary school enrollment (0.5–100); female-to-male life expectancy ratio (0.97–1.12); per capita dietary energy supply (1,522–3,605).

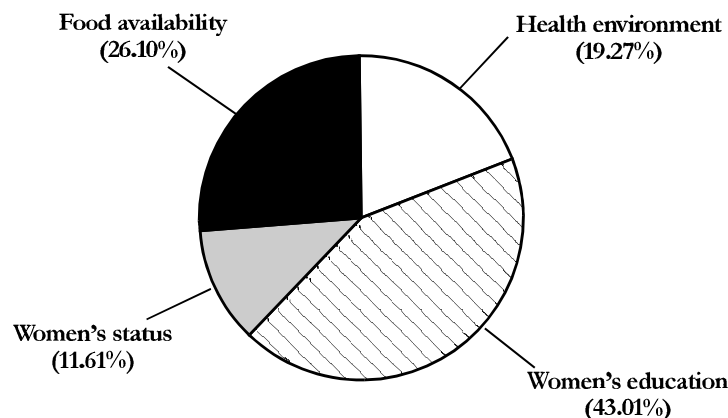
Drawing on the regression results, the study estimated the contribution each underlying determinant made to the decline in the developing-country underweight rate from 1970 to 1995. Two factors were taken into account. First, the strength of each determinant's impact was measured by the size of the increase required to reduce the underweight rate by 1 percentage point. The smaller the required increase, the greater the strength of impact. These numbers are given in the upper panel of Table A6.1, column 1.

It would take only a 4.6 percentage-point increase in female secondary school enrollment to reduce the child underweight rate by 1 percentage point, implying that women's education up to the secondary level has a very strong impact. In fact, from an absolute standpoint, all of the underlying determinants considered have a fairly strong impact. A scale-neutral measure that allows consideration of the relative strength of impact of the variables is given in column 2. It indicates that for the developing countries as a whole, women's education has the strongest effect on underweight rates among the underlying determinants, followed closely by countries per capita dietary energy supplies. Women's relative status comes in third, followed by access to water.

The second factor taken into account in estimating the determinants' relative contributions is the amount that each actually changed over the 25 years, which is partially a matter of public policy choices. Column 3 of the table reports the increase of each determinant, with the numbers again standardized by range, so that a scale-neutral comparison can be made. Water access increased by far the most, followed by female secondary school enrollment and per capita dietary energy supplies. The determinant that changed the least was women's relative status. Based on the numbers in columns 1 and 3 in the table, the estimated contribution of each determinant to the total reduction in the developing-country underweight rate is given in column 4. Per cent contributions are illustrated in Figure A6.1.

The study found that increases in one of the proxies for care, women's education, have made the greatest contribution, being responsible for 43% of the total reduction caused by underlying determinants. This is due to both its strong effect and fairly large increases over the period. Improvements in food availability contributed to 26% of the reduction; health environment improvements, to 19%. Partly because there has been little improvement over the 25 years, the contribution of women's

**FIGURE A6.1 : Estimated contributions of underlying determinants to reducing the developing-country underweight rate, 1970–95**



Source: 1.

relative status, important for both care provision and food production, while still substantial, was estimated to be the lowest (about 12%).

The lower panel of the table gives the same numbers for the two basic determinants considered. Column 1 indicates that per capita national income has a strong impact on child undernutrition, while from an absolute standpoint, democracy also has the potential to make a substantial difference.

A key message of the study is that any comprehensive strategy for attacking the problem of child

malnutrition must include actions to address both its basic *and* underlying causes. If national income is not improved, the resources necessary for investing in health environments, women's education and status, and food availabilities will not be available.

Actions at both levels will bolster the crucial efforts of more direct nutrition interventions, such as breastfeeding promotion, nutrition communications, food fortification, and micronutrient supplementation.

## REFERENCES

1. Smith LC, Haddad L (1999) *Explaining child malnutrition in developing countries: A cross-country analysis*. Research Report 111. Washington, DC: IFPRI.

## APPENDIX 7

# DATA EMPLOYED FOR ANALYSIS OF CHILD UNDERWEIGHT RATES IN SUB-SAHARAN AFRICA

Countries with periods of decreased underweight prevalence (%) (n = 18)		Countries with periods of increased underweight prevalence (%) (n = 18)	
Benin	1987: 35.0 1996: 24.5	Comoros	1991: 15.5 1995: 21.7
Burkina Faso	1987: 45.5 1992: 32.7	Congo, Democratic Republic	1989: 25.0 1994: 35.0
Cameroon	1977: 17.3 1991: 15.1	Côte d Ivoire	1986: 12.4 1994: 20.0
Congo, Republic	1977: 32.2 1987: 23.5	Ethiopia (rural)	1983: 37.3 1992: 47.7
Congo, Democratic Republic	1975: 28.8 1989: 25.0	Guinea	1980: 23.4 1995: 26.0
Ghana	1987: 27.1 1993: 22.9	Lesotho	1981: 13.3 1994: 21.4
Kenya (rural)	1982: 22.0 1987: 18.0	Madagascar	1983: 28.0 1992: 40.9
Lesotho	1976: 17.3 1981: 13.3	Malawi	1981: 23.9 1992: 27.6
Madagascar	1992: 40.9 1995: 34.1	Malawi	1992: 27.6 1995: 29.9
Mauritania	1981: 31.0 1987: 30.0	Mauritania	1987: 30.0 1990: 47.6
Mauritius	1985: 23.9 1995: 14.9	Nigeria	1990: 35.3 1993: 39.1
Niger	1985: 49.4 1992: 42.6	Rwanda	1976: 27.9 1992: 29.4
Sierra Leone	1974: 28.2 1977: 23.2	Senegal	1986: 17.5 1992: 22.2
Tanzania	1987: 33.0 1991: 28.9	Sierra Leone	1977: 23.2 1990: 28.7
Togo	1976: 26.1 1988: 24.6	Tanzania	1991: 28.9 1996: 30.6
Uganda	1977: 33.2 1988: 23.0	Uganda	1988: 23.0 1995: 25.5

Countries with periods of decreased underweight prevalence (%) (n = 18)		Countries with periods of increased underweight prevalence (%) (n = 18)	
Zambia	1992: 25.2 1996: 23.5	Zambia	1985: 20.5 1992: 25.2
Zimbabwe	1984: 14.0 1988: 11.5	Zimbabwe	1988: 11.5 1994: 13.0

Source: 1.

## REFERENCE

1. Smith LC, Haddad L (1999) *Explaining child malnutrition in developing countries: A cross-country analysis*. Research Report 111. Washington, DC: IFPRI.



## APPENDIX 8

# PREVALENCE AND NUMBERS OF OVERWEIGHT PRESCHOOL CHILDREN IN 1995

UN regions and sub-regions	Overweight (> +2 SD weight-for-height)			
	Countries <sup>a</sup> (number/total)	Population coverage (%)	%	Numbers affected (000s)
<i>Africa</i>	30/53	70.9	n/a	n/a
Eastern Africa	13/17	68.0	n/a	n/a
Middle Africa	2/9	20.7	n/a	n/a
Northern Africa	4/6	77.2	8.1	1,645
Southern Africa	2/5	88.2	6.5	375
Western Africa	9/16	90.7	2.6	888
<i>Asia</i>	26/46	92.4	2.9	10,643
Eastern Asia	2/4	94.4	4.3	4,719
South Central Asia	11/14	98.9	2.1	3,719
South-Eastern Asia	4/10	82.5	2.4	1,327
Western Asia	9/18	54.8	n/a	n/a
<i>Latin America and the Caribbean</i>	19/33	94.1	4.4	2,429
Caribbean	4/13	64.8	n/a	n/a
Central America	6/8	97.9	3.5	564
South America	9/12	95.5	4.9	1,729
<i>Developing countries</i>	78/147	87.8	3.3	17,561

Source: 1.

Note: n/a = not available.

<sup>a</sup> Number of countries that have national surveys out of the total number of countries for each sub-region.

## REFERENCE

1. WHO (2000) *Global Database on Child Growth and Malnutrition: Forecast of Trends*. Document WHO/NHD/00.3. Geneva: WHO.

## APPENDIX 9

# COUNTRIES CLASSIFIED BY WHO REGIONS

Africa	Americas	South-Eastern Asia	Europe	Eastern Mediterranean	Western Pacific
Algeria	Argentina	Bangladesh	Albania	Afghanistan	Cambodia
Angola	Bolivia	Bhutan	Armenia	Egypt	China
Benin	Brazil	India	Azerbaijan	Jordan	Fiji
Botswana	Chile	Indonesia	Belarus	Iran	Lao People's
Burkina Faso	Colombia	Maldives	Belgium	Iraq	Democratic
Burundi	Cuba	Myanmar	Bosnia and	Saudi Arabia	Republic
Cameroon	Dominican	Nepal	Herzegovina	Lebanon	Malaysia
Cape Verde	Republic	Sri Lanka	Bulgaria	Libyan A. J.	Mongolia
Central African	El Salvador	Thailand	Croatia	Morocco	Papua New
Republic	Ecuador		Estonia	Oman	Guinea
Chad	Guatemala		Georgia	Pakistan	Philippines
Comoros	Haiti		Germany	Somalia	Viet Nam
Congo	Honduras		Greece	Sudan	
Côte d'Ivoire	Mexico		Hungary	Syrian Arab	
Democratic	Nicaragua		Italy	Republic	
Republic of	Panama		Kazakhstan	Tunisia	
Congo	Paraguay		Kyrgyzstan	United Arab	
Equatoria	Peru		Lithuania	Emirates	
Guinea	Uruguay		Luxembourg	Yemen	
Eritrea	Venezuela		Poland		
Ethiopia			Portugal		
Gabon			Republic of		
Gambia			Moldova		
Ghana			Romania		
Guinée			Russian		
Guinea-Bissau			Federation		
Kenya			Slovenia		
Lesotho			Spain		
Liberia			Tajikistan		
Madagascar			Former Yugoslav		
Malawi			Republic of		
Mali			Macedonia		
Mauritania			Turkey		
Mozambique			Turkmenistan		
Namibia			Ukraine		
Niger			Uzbekistan		
Nigeria			Yugoslavia		
Rwanda					
São Tomé and					
Príncipe					
Senegal					
Sierra Leone					
South Africa					
Swaziland					
Togo					
Uganda					
United Republic					
of Tanzania					
Zambia					
Zimbabwe					

Source: 1.

## REFERENCE

1. United Nations (1998). *World Population Prospects 1950–2050 (The 1998 Revision)*. New York: UN.

## APPENDIX 10

# NATIONAL IMPLEMENTATION OF THE INTERNATIONAL CODE OF MARKETING OF BREASTMILK SUBSTITUTES

### Law (20 countries)

Bahrain  
Brazil  
Burkina Faso  
Cameroon  
Costa Rica  
Côte d'Ivoire  
Dominican Republic  
Guatemala  
India  
Iran  
Lebanon  
Madagascar  
Nepal  
Panama  
Peru  
Philippines  
Sri Lanka  
Tanzania  
Uruguay  
Zimbabwe

### Many provisions law (26 countries)

Austria  
Bangladesh  
Belgium  
China  
Colombia  
Denmark  
Finland  
France  
Germany  
Greece  
Indonesia  
Ireland  
Italy

### Lao (PDR)

Mexico  
Netherlands  
Nigeria  
Norway  
Oman  
Papua New Guinea  
Portugal  
Senegal  
Spain  
Tunisia  
United Kingdom  
Viet Nam

### Few provisions law (20 countries)

Algeria  
Armenia  
Benin  
Canada  
Chile  
Cuba  
Estonia  
Ethiopia  
Guinea  
Guinea-Bissau  
Hungary  
Israel  
Japan  
Mongolia  
Mozambique  
Saudi Arabia  
Turkey  
United Arab Emirates  
Yemen  
Zaire

### Voluntary (12 countries)

Australia  
Bolivia  
Ecuador  
Kenya  
Kuwait  
Malawi  
Malaysia  
New Zealand  
South Africa  
Thailand  
Trinidad and Tobago  
Zambia

### Some provisions voluntary (8 countries)

Bhutan  
Hong Kong  
Jamaica  
Korea (Republic of)  
Singapore  
Switzerland  
Uruguay  
Venezuela

### Measure drafted, awaiting final approval (20 countries)

Albania  
Botswana  
Burundi  
Cape Verde  
Congo  
Côte d'Ivoire  
El Salvador  
Gabon  
Georgia

**Measure drafted,  
awaiting final approval  
(20 countries)** *Continued*

Ghana  
Haiti  
Iraq  
Jordan  
Morocco  
Namibia  
Nicaragua  
Pakistan  
Sierra Leone  
Sweden  
Uganda

**Being studied  
(27 countries)**

Angola  
Argentina  
Belarus  
Cambodia  
Croatia  
Czech Republic  
Egypt  
Eritrea  
Gambia  
Honduras

Latvia  
Lesotho  
Lithuania  
Macedonia  
Mali  
Mauritania  
Mauritius  
Myanmar (Union of)  
Niger  
Paraguay  
Poland  
Romania  
Russian Federation  
Rwanda  
Slovakia  
Syrian Arab Republic  
Togo

**Action to end free  
supplies only  
(2 countries)**

Libyan Arab Jamahiriya  
Sudan

**No action (7 countries)**

Central African Republic  
Chad

Iceland  
Kazakhstan  
Moldova  
Somalia  
United States

**No information  
(18 countries)**

Afghanistan  
Azerbaijan  
Bosnia/Herzegovina  
Bulgaria  
Guyana  
Korea (DPR)  
Kyrgyzstan  
Liberia  
Netherlands Antilles  
Niue  
Federal Republic of  
Yugoslavia  
Slovenia  
Tajikistan  
Tokelau  
Turkmenistan  
Ukraine  
U.S. Virgin Islands  
Uzbekistan

## KEY TO CATEGORIES

**Law:** These countries have enacted legislation or other legal measures encompassing all or substantially all provisions of the International Code.

**Many provisions law:** The countries in this category have enacted legislation or other legal measures encompassing many of the provisions of the International Code.

**Few provisions law:** These countries have enacted legislation or other legal measures encompassing a few provisions of the International Code.

**Voluntary:** In these countries, the government has adopted all, or nearly all provisions of the International Code through non-binding measures.

**Some provisions voluntary:** In these countries, the government has adopted some but not all provisions of the International Code through non-binding measures.

**Measure drafted, awaiting final approval:** In these countries, a final draft of a law or other measure has been recommended to implement all or many of the provisions of the International Code, and final approval is pending.

**Being studied:** A government committee in each of these countries is still studying how best to implement the International Code.

**Action to end free supplies only:** In these countries, the government has taken some action to end free and low-cost supplies of breastmilk substitutes to health care facilities but has not implemented other parts of the International Code.

**No action:** These countries have taken no steps to implement the International Code.

**No information:** No information is available for these countries.

Source: Nutrition Section, UNICEF, with assistance of the International Code Documentation Centre, Penang, Malaysia.

## APPENDIX 11

# SUMMARY OF FIVE STUDIES OF THE SOCIAL IMPACTS OF THE INDONESIAN CRISIS

The five studies referred to in section 4.2 are described in greater detail here:

1. Helen Keller International (HKI) set up a nutrition surveillance system in rural Central Java from late 1995 to early 1997. With support from the U.S. Agency for International Development (USAID) and the Asian Development Bank, this system was revived in June 1998 and initiated in rural and urban areas in five other provinces.
2. The Rand Corporation, the University of California, Los Angeles (UCLA), and the Demographic Institute at the University of Indonesia had been conducting a large ongoing longitudinal survey—the Indonesian Family Life Survey—since 1993/94. The survey covers 30,000 individuals in 13 of 27 provinces and is representative of 83% of the national population. IFLS-2 was conducted in late 1997 and IFLS2+, a special sub-sample of approximately 7,500 individuals, was conducted in late 1998 in a deliberate effort to track the impacts of the crisis. IFLS2+ was funded by a number of organizations, including the World Health Organization (WHO), the UN Fund for Population Activities (UNFPA), the World Bank, and IFPRI.
3. The 100 Village Survey, supported by UNICEF and carried out in July 1997 and August 1998 by the Central Bureau of Statistics, interviewed households from 100 villages drawn from eight provinces.
4. SMERU, a new unit set up within the Government of Indonesia to monitor the social impacts of the crisis with support from the World Bank, conducted a Crisis Impact Survey in 1997 and 1998—a qualitative assessment of the situation by local experts in each of the country's 4,025 *kecamatan*s or sub-districts.
5. Finally, the Faculty of Economics at the University of Indonesia (LPEM), supported in part by the Asian Development Bank, conducted an analysis of the government's SUSENAS national income and expenditure data sets from 1996 and 1998.

**TABLE A11.1 : Social impacts of the Indonesian crisis**

	Data source/study				
	HKI: 1,2	IFLS: 3,4	UNICEF 100 Village Survey/ SMERU: 5	Crisis Impact Survey/ SMERU: 6	SUSENAS/ LPEM: 7
Years	Dec. 1995 Jan. 1999 (8 rounds, rural Central Java only); June 1998 March 1999 (4 rounds, 6 areas)	Second half of 1997 and second half of 1998	June/July 1997 and August 1998	1997 and same month in 1998	1996 and 1998
Coverage	Central Java (rural sample), East Java (rural and urban), South Sulawesi (urban sample), West Nusa Tenggara (Lombok island), Jakarta (urban), West Java (rural)  (All time comparisons reported here are for the Central Java sample only)	7 of 27 provinces: Jakarta, Central Java, West Java, West Nusa Tenggara, South Kalimantan, South Sumatra, North Sumatra  (IFLS2+ is representative of IFLS, which is representative of 83% of population)	10 <i>kabupaten</i> (from over 300) in 8 of 27 provinces: West Java, Central Java, Bali, NTT, East Kalimantan, South-East Sulawesi, Riau, Lampung	Nationwide: response from each of 4,025 <i>kecamatan</i> s	Nationwide
Percent households with no savings	Increased				
Change in per capita consumption, overall (thousands of rupiah)		Mean 246→186 Median 131→129 With IFLS deflators: Mean 246→151 Median 131→104			
Per capita consumption, urban (thousands of rupiah)		Mean 319→211 Median 141→134  With IFLS deflators: Mean 319→184 Median 141→116	Mean 673→588 Median 551→499	14 of 20 hardest-hit areas (increase in % of households selling assets to meet basic needs) are urban	
Per capita consumption, rural (thousands of rupiah)		Mean 194→168 Median 127→125  With IFLS deflators: Mean 194→128 Median 127→95	Mean 457→384 Median 407→327	13 of 20 least-affected units are rural (same measure as above)	
Gini coefficient			0.284→0.313 Urban 0.299→0.298 Rural 0.266→0.298		
Overall poverty rate (%)		11.0→13.8 With IFLS deflators: 11.0→19.9	11.0→14.4 With IFLS deflators: 11.0→18.6		20.22→33.04 Or adjusted : 18.31→30.49



		Data source/study			
		HKI: 1,2	IFLS: 3,4	UNICEF 100 Village Survey/ SMERU: 5	Crisis Impact Survey/ SMERU: 6
					SUSENAS/ LPEM: 7
Urban poverty rate (%)			9.2→12.0 With IFLS deflators: 9.2→15.8		10.55→20.29 Or adjusted : 6.93→14.71
Rural poverty rate (%)			12.4→15.2 With IFLS deflators: 12.4→23.0		25.67→41.31 Or adjusted : 24.72→40.73
Worst-hit region in terms of household expenditures			West Java (% change in mean); South Kalimantan (% change in median)	NTT	Java
Budget share to food			70%→74%	66.2%→75.7%	
Budget share of staple foods, urban			12.99%→20.61%		
Budget share of staple foods, rural			30.58%→39.39%		
Budget share of nonstaple foods, urban			29.2%→25.5%		
Budget share of nonstaple foods, rural			29.3%→27.8%		
Zero consumption of eggs by mothers	Up sharply				
Consumption of meat and eggs, children under 5	Down				
Per cent under 5 stunting	n/a		50.68→45.66 (9-year-olds)		
Per cent under 5 underweight	Up				
Per cent under 5 wasting	Up		8.57→5.59 (9-year-olds)		
Per cent of adults with BMI 18	Up (mothers only)		14.05→14.69 (from 1997 to 1998 in the same communities)		
Per cent low haemoglobin (10 mg/dL)			6.68→5.02 (from 1997 to 1998 in the same communities)		

		Data source/study			
		HKI: 1,2	IFLS: 3,4	UNICEF 100 Village Survey/ SMERU: 5	Crisis Impact Survey/ SMERU: 6 SUSENAS/ LPEM: 7
Maternal anaemia	Up				
Childhood anaemia	Up				
Maternal and child night blindness	Up				
Budget share to health, urban (rural)			1.73%→1.49% (1.16%→ 0.69%)		
Budget share to education, urban (rural)			4.91%→4.51% (2.38%→1.81%)		
Per cent of children 7-12 not enrolled in school, male (female)			5.1→6.1 (3.4→6.2)	11.2→7.9 (9.2→6.7)	
Per cent of children receiving vitamin A capsules in 6 months before survey	Down		55.12→42.75		

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## APPENDIX 12

# SOME FOOD AND NUTRITION INFORMATION AND DATA RESOURCES ON THE INTERNET

Organization/dataset	Internet address	Comments
ACC/SCN homepage	<a href="http://www.unsystem.org/accscn/">www.unsystem.org/accscn/</a>	Information and links to many other nutrition-related sites
ANDI	<a href="http://www.africanutrition.net">www.africanutrition.net</a>	Nutrition data for African countries
Arbor/Nutrition Guide	<a href="http://www.arborcom.com/frame/welcome.htm">www.arborcom.com/frame/welcome.htm</a>	Abstracts from food and nutrition journals
Cochrane database	<a href="http://www.medlib.com/spi/library.htm">www.medlib.com/spi/library.htm</a>	Database of systematic reviews on health care issues (requires a subscription)
DHS/Survey Information Search	<a href="http://www.macrint.com/dhs/surveys/modulesearch.asp">www.macrint.com/dhs/surveys/modulesearch.asp</a>	Downloadable data from the Demographic and Health Surveys
ENN/ Emergency Nutrition Network	<a href="http://www.tcd.ie/ENN">www.tcd.ie/ENN</a>	Includes ENN reports and articles and links to other sites
FAO/FAOSTAT	<a href="http://apps.fao.org/cgi-bin/nph-db.pl">http://apps.fao.org/cgi-bin/nph-db.pl</a>	Includes data on food availability from food balance sheets
FIVIMS/technical notes	<a href="http://www.fao.org/waicent/fivims/kims/diagram/tech.htm">www.fao.org/waicent/fivims/kims/diagram/tech.htm</a>	Technical notes on sub-national data collection and aggregation on food security
Freedom House	<a href="http://www.freedomhouse.org/survey99/">www.freedomhouse.org/survey99/</a>	Indicators of civil and political rights
HINAP	<a href="http://www.hinap.org">www.hinap.org</a>	Health information on selected countries of the developing world, regularly updated
ICCIDD	<a href="http://www.people.virginia.edu/~jtd/iccidd/mi/idd.htm">www.people.virginia.edu/~jtd/iccidd/mi/idd.htm</a>	Includes IDD prevalence data
IFPRI/Food Consumption and Nutrition Division	<a href="http://www.cgiar.org/ifpri/divs/fcnd/dp.htm">www.cgiar.org/ifpri/divs/fcnd/dp.htm</a>	Downloadable papers on poverty, food consumption, and nutrition
ILO/databases	<a href="http://www.ilo.org/public/english/support/lib/dblist.htm#statistics">www.ilo.org/public/english/support/lib/dblist.htm#statistics</a>	Includes data on labor laws, standards, and migration
MI	<a href="http://www.mn-net.org/">www.mn-net.org/</a>	Data on IDD, VAD and IDA prevalences
National Library of Medicine/MEDLINE	<a href="http://www.ncbi.nlm.nih.gov/PubMed/">www.ncbi.nlm.nih.gov/PubMed/</a>	Abstracts from many nutrition and medical journals

Organization/dataset	Internet address	Comments
NGONUT	<a href="mailto:owner-ngonut@abdn.ac.uk">owner-ngonut@abdn.ac.uk</a>	An email forum for nutrition professionals
SPHERE	<a href="http://www.sphereproject.org">www.sphereproject.org</a>	Includes the Sphere project handbook and training materials
UNAIDS	<a href="http://www.unaids.org/hivaidinfo/hiv.html">www.unaids.org/hivaidinfo/hiv.html</a>	Data on HIV/AIDS
UNDP/human development indicators	<a href="http://www.undp.org/hdro/indicators.html">www.undp.org/hdro/indicators.html</a>	Statistics from <i>Human Development Reports</i>
UNEP/World Resources Institute	<a href="http://www.wri.org/wri/facts/data-tables.html">www.wri.org/wri/facts/data-tables.html</a>	Environmental data tables (include data on atmosphere and climate, biodiversity, pollution)
UNEP/World Terrestrial Ecosystem Monitoring Sites	<a href="http://www.wsl.ch/rauminf/riv/datenbank/tems/database_tem.html">www.wsl.ch/rauminf/riv/datenbank/tems/database_tem.html</a>	Includes data on soil PH, climate, vegetation, soils, etc.
UNESCO	<a href="http://unescostat.unesco.org/en/stats/stats0.htm">http://unescostat.unesco.org/en/stats/stats0.htm</a>	World education indicators
UNFPA/State of the World Population 1999	<a href="http://www.unfpa.org/swp/1999/fact.htm">www.unfpa.org/swp/1999/fact.htm</a>	Includes data on world population trends by age, gender, and location
UNHCR/statistics	<a href="http://www.unhcr.ch/statist/main.htm">www.unhcr.ch/statist/main.htm</a>	Includes data on refugee populations and asylum applications
UNICEF/State of the World's Children, statistical tables	<a href="http://www.unicef.org/sowc98/stats.htm">www.unicef.org/sowc98/stats.htm</a>	Includes data reported in <i>State of the World's Children</i>
USAID/Health Statistics Database	<a href="http://www.info.usaid.gov/regions/afr/hhrra/enotes/en19txt.htm">www.info.usaid.gov/regions/afr/hhrra/enotes/en19txt.htm</a>	Links to the USAID-supported Health Statistics Database
WFP/statistics	<a href="http://www.wfp.org/InfoServs_Home.html">www.wfp.org/InfoServs_Home.html</a>	Includes data on food aid shipments and resource flows
WFP/vulnerability analysis and mapping	<a href="http://www.wfp.it/vam/vamhome.htm">www.wfp.it/vam/vamhome.htm</a>	Food vulnerability and mapping reports
WHO/Global Database on Child Growth and Malnutrition	<a href="http://www.who.int/nutgrowthdb/">www.who.int/nutgrowthdb/</a>	Data on stunting, wasting, and underweight
WHO/Statistical Information System	<a href="http://www.who.int/whosis/">www.who.int/whosis/</a>	Includes data on immunization coverage and health personnel
World Bank	<a href="http://www.worldbank.org/data/">www.worldbank.org/data/</a>	Development data
World Bank/Living Standards Measurement Surveys	<a href="http://www.worldbank.org/html/prdph/lsmis/guide/select.html">www.worldbank.org/html/prdph/lsmis/guide/select.html</a>	Integrated household survey data on incomes, expenditures, education, health, nutrition, etc.

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